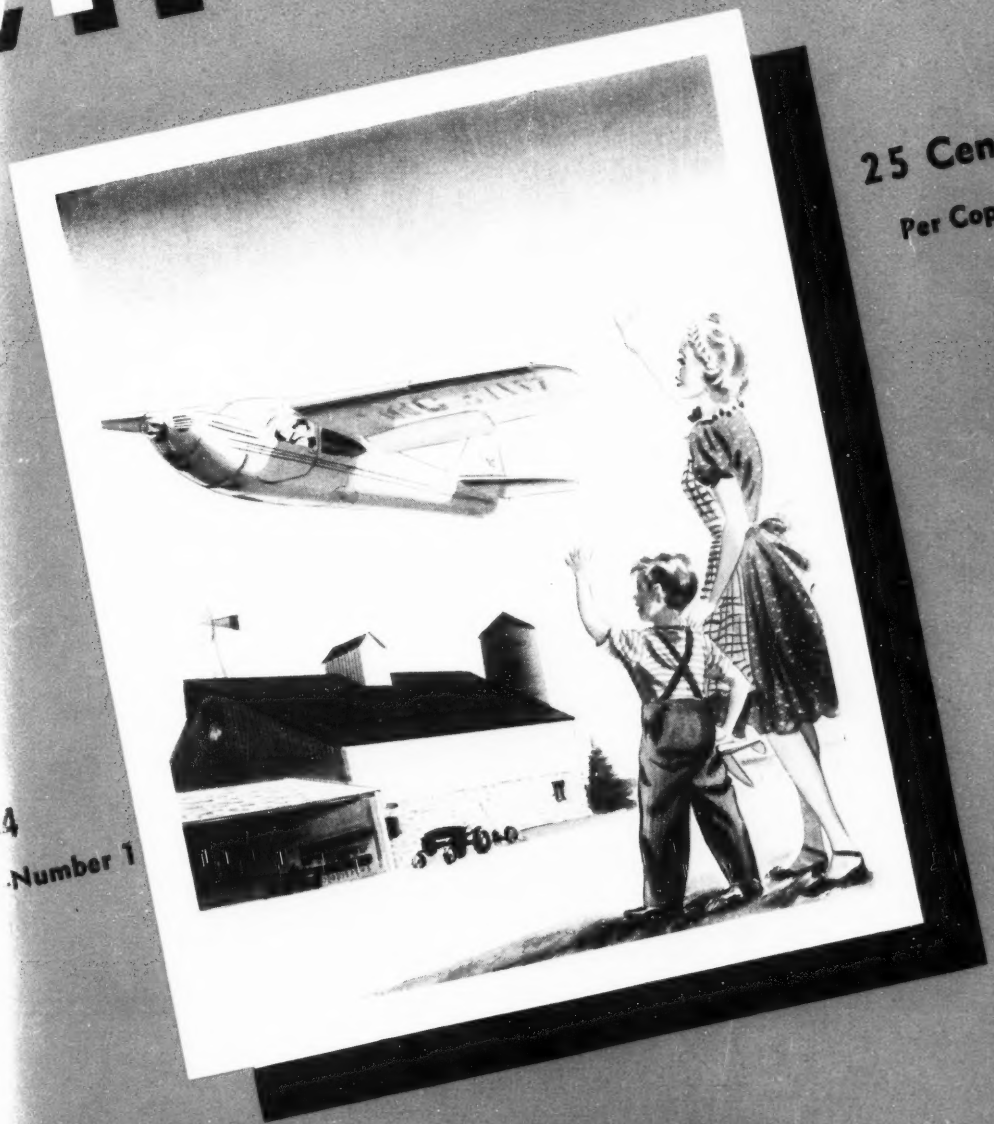
POST WAR ISSUE

THE CORNELL ENGINEER



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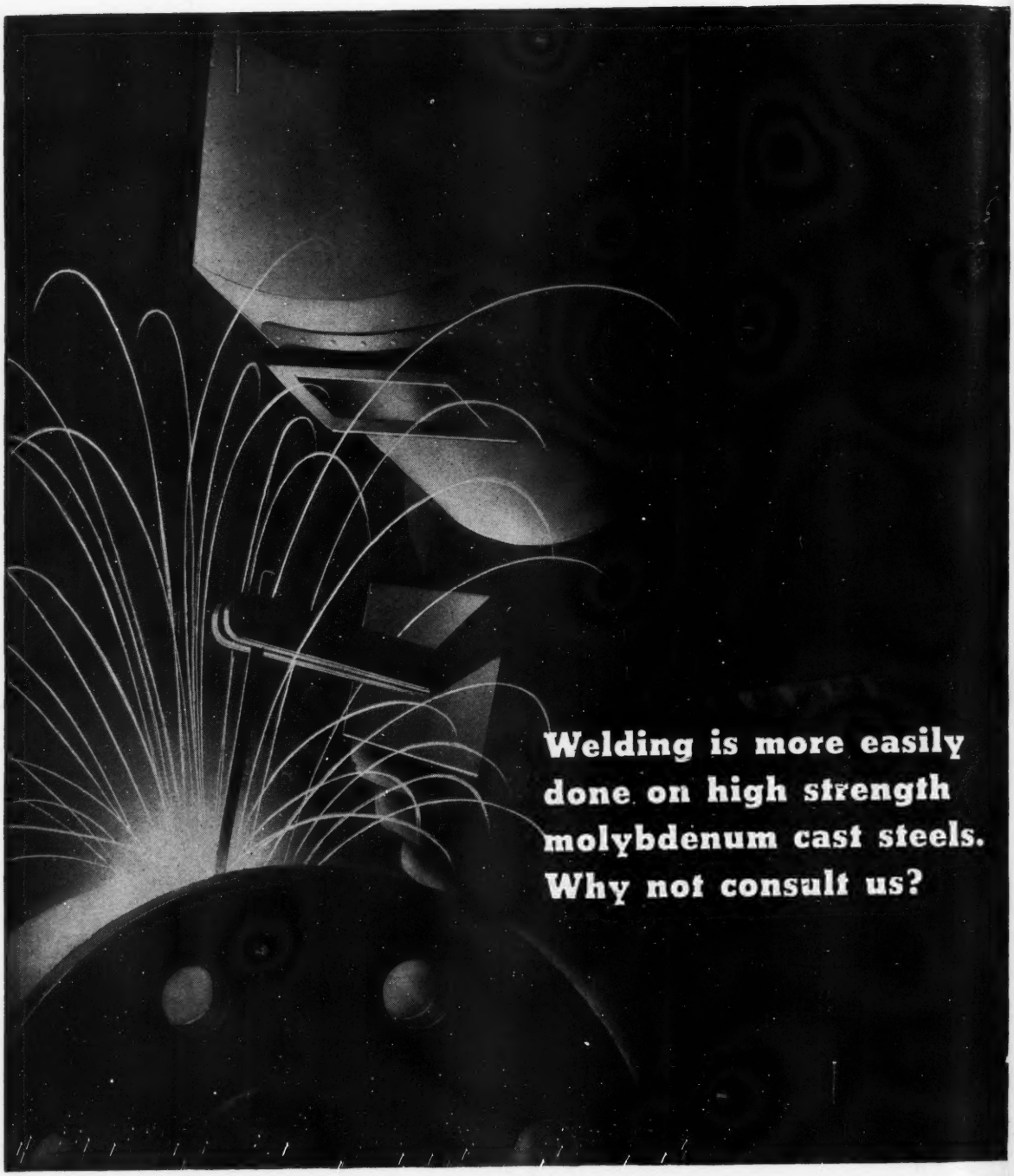

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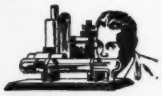
MOLY

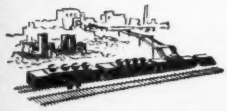
KEEPING UP WITH

Electricity

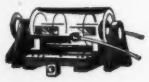
SYNTHETIC FIREFLIES . . . New Westinghouse fluorescent marker lamp rivals the firefly in economy of light generation. Tiny lamp, consuming only 1/10th watt, will prevent mishaps on dark stairsteps. Unlike lightning bug, it can be kept glowing continuously—at practically no cost.



1/50,000,000th OUNCE . . . That's the weight of a single layer of oxygen atoms the size of an air-mail stamp. Westinghouse research engineers have built a delicate balance that measures the weight of such a microscopic layer of oxide on metal—to determine resistance of special alloys to high temperatures.



POWERHOUSE ON WHEELS . . . The retreating enemy knows that the quickest way to paralyze a city is to destroy its powerhouse. Advancing Allies know that the quickest way to restore order is to restore power. A 5000 KW power train, built by Westinghouse, moves in on railroad tracks, hooks up to power lines, starts boiler and generator . . . then lights come on, order emerges.



INSIDE STORY . . . Transparent Lucite bearings now permit research engineers to visualize performance of lubricating oil in bearings, subjected to varying operating speeds and pressures. Red pigment shows where oil goes and what it does.

PREFORMED PLASTICS . . . New Westinghouse process in plastics manufacture "beats" resins into cellulose fibre, then shapes mixture over perforated copper form. Plastic is peeled off and dried, then placed in heated mold and pressed into final shape. Saves time in making reinforced plastics of intricate shapes.

Portrait of a Scientist

creating a better yardstick for testing wartime metals

Spectrum analysis provides the *quickest* and *most* accurate method for checking the composition of metals used in making guns, planes, tanks and ships.

Iron has long been used as a *yardstick of comparison* in spectrography—because of the large number of lines in the iron spectrum.

Formerly, the best standard obtainable was *iron only 99.9 per cent pure*—containing impurities that produced confusing lines in spectrographic pictures.

Westinghouse research engineers tackled the difficult problem of producing a purer iron—a *better* yardstick for testing wartime metals.

They accomplished this by fusing the purest iron obtainable in a high-frequency induction furnace, surrounded by an atmosphere of hydrogen gas.

Result: iron 99.99 per cent pure—containing only 1 part metallic impurities in 10,000 parts of absolutely pure iron!

Today, this ultra-pure iron is "mass-produced" by Westinghouse at the rate of 1000 pounds per year—and is used in all parts of the anti-Axis world to improve the quality of war material.

A significant contribution, by Westinghouse, to industry at war and in the days of peace to come. *Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pa.*

Westinghouse

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WESTINGHOUSE PRESENTS John Charles Thomas, *Sunday 2:30, EWT, NBC.*
Ted Malone, *Monday, Wednesday, Friday 10:15 pm. EWT, Blue Network.*

The Hardest *Metal* Made by Man

may write the price tags of tomorrow!

Starting as a metal powder, Carboloy Cemented Carbide is transformed, under heat and pressure, into an endless variety of shapes and forms—tool tips, dies and machine parts with the *super-hardness* that is vital to high-speed, low-cost industrial production.

IT TOOK a war production crisis to bring this magic metal into its own — to bring full appreciation of its value for metal-working tools and for "wear-proofing" parts.

The cold, hard figuring of comparative manufacturing costs soon will prove its full value in peacetime manufacture.

It is safe to say that Carboloy Cemented Carbide has revolutionized the thinking of industrial engineers and production men — not only as to materials and product design, but as to *tool performance and cost of manufacture.*

It started U. S. tanks rolling

An example! Without carbide tools the machining of armor plate for U. S. tanks would have been virtually impossible at the rate the emergency demanded. More than that, cemented carbides *saved millions of dollars and millions of manhours in manufacture.* As one noted authority recently said, "Today the tungsten carbides...perform miracles..."

We are in a new age of harder, tougher alloys — of special-purpose machinery — of longer life for products and parts — of closer tolerances combined with mass production.

For the coming "battle of costs"

Tomorrow's uses for Carboloy Cemented Carbide are widespread in many fields. Machining all types of hard and soft metals and plastics. Drawing wire and tubing. Drawing and forming sheet metal. "Wear-proofing" parts.

It has the *super-hardness* needed to handle modern metals. It works at speeds once thought impossibly high. It slashes machining costs—commonly doubles or triples the output of men and machines. It may well write the price tags in the coming "battle of costs."

Manufacturers in every field are invited to take full advantage of Carboloy engineering, experience and facilities in planning for the race to get better products to market, at lower cost, after the war.

CARBOLOY COMPANY, INC., DETROIT 32, MICHIGAN

CARBOLOY
TRADE MARK

CEMENTED CARBIDE
THE HARDEST METAL MADE BY MAN

SPECIAL POST WAR ISSUE

The FOUNDED 1885

CORNELL ENGINEER

VOLUME 10 1944 NUMBER 1

CONTENTS

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INTRODUCING CEPWI

TEN months ago our Assistant Editor conceived the idea of a special issue of the CORNELL ENGINEER devoted exclusively to a collection and analysis of post-war plans. Accordingly, fifty letters were sent out to representative manufacturers, planning bureaus, and authors of post war articles. Replies showed that most plans were vague and indefinite because everyone was devoting all time and thought to war work. A Post War Issue at that time would have been a rather thin one.

Four months ago we decided to try again, and began to assemble magazine articles, newspaper stories, news releases, interviews, and correspondence with 200 large firms. The total response showed a definite trend toward post-war planning. Some companies, in pursuing their war work, had recently developed new products which they were interested in displaying to the public; a large number of others stated that they had radical new designs completed or in process of completion which they did not wish to reveal to competitors.

Certain fields have had their progress greatly accelerated by the war while others have been retarded. The communications field and the electrical industry in general were not required to convert to an entire new line of products in order to help the war program; so they have profited by wartime developments in electronics, power, and engineering materials. Shortages and the necessity of substitutions have resulted in new alloys, new welding and fabrication processes, and a tremendous expansion of the plastics industry. Transportation by rail and highway has been stalled by the war, but warplane production has shown airplane designers new tricks which they can incorporate into post-war liners and flivvers. As war bonds come due and other savings are spent, housing will see a boom. New houses will be better mainly because of new materials, new gadgets, and new construction methods. New ways of food production will be simply a matter of new packaging, new processing, and the introduction of frozen food use into every household.

In the following pages, we hope to show you some of the latest new things which have been produced. These are the types of goods you will be able to utilize shortly after the war. We hope you will find the pictures and articles interesting. Perhaps they will give you some new ideas.

C.C.H.

American Industry—Where to Next?
—Courtesy General Electric Co.

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—Courtesy

POST

TRANSPORTATION—

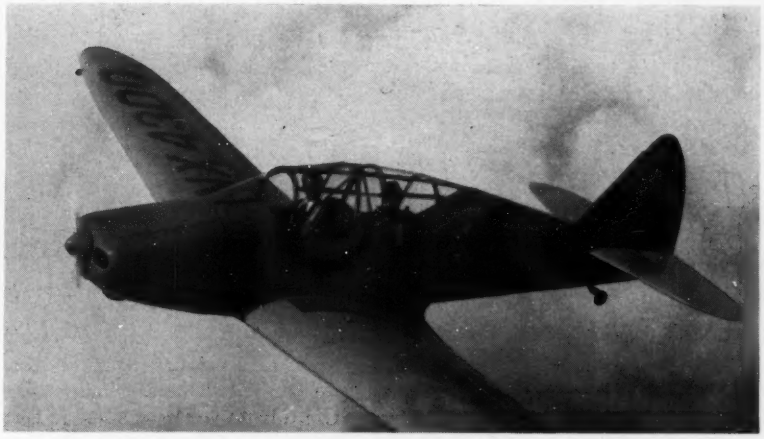
Edited By MALCOLM E. STEINBERG, CE '47

Airports

BEFORE any private plane air age can come, new airports will have to be built and special landing areas will have to be constructed. There will be, of course, the big airports in the larger cities to accommodate the great airliners and cargo planes. But more important to the amateur civilian pilot than these are small landing strips and airports. These landing facilities are vital to private flying, and landing strips will have to dot the country, spaced at perhaps ten-mile intervals. They will serve as landing spots in emergencies and they will make it easier for the pilot to get from his plane to someplace on the ground once he has landed. When properly marked and indicated on an airmap, they will make it possible for the private flyer to know his exact location at any time. Civil air authorities indicate that several hundred thousand air markers alone will be needed to keep the amateur pilot from becoming lost. Cities and towns are being encouraged to construct these landing facilities.

"Grasshoppers"

THE great swing toward light airplanes in pre-war days is an excellent indication of what post-war days may bring. Light planes will then dominate the air just as popular priced-cars dominate the road. The "grasshoppers," as they have been called by the armed services, have been doing almost every kind of auxiliary work on the battlefield. The lessons learned in these wartime roles, the developments made in wartime research and design will combine to yield a finer, smarter, more economical lightweight plane for full enjoyment when peacetime comes.



The Piper Cub PT is the trainer version of several experimental planes incorporating low-wing design and retractable landing gear.

There are many ideas set forth today concerning the coming air age. What will it be like? What will the planes be like? Will everyone own his own plane? The answers lie in the future itself. Our rapidly changing world, the possibilities of new and startling developments in aircraft design and the desires of the people themselves combine to make it difficult to preview the air age of the future.

Certain things do, however, indicate the possibility of a great air age of the future. America has been made air minded. The result of pilot training programs, both civilian and military, will be that many more Americans will consider flying the best means of transportation. The vast experience being gained in wartime manufacture and experimentation with new metals, plastics, and fuels will assure us of planes that everyone can own and can fly easily.

The light plane of the future will open many new possibilities in business and pleasure. But to become a widely used mode of transportation, the planes will have to meet certain demands. **The light private planes will have to have a low cost and operating expense, be able to land and take off in a shorter distance, be safer, be easier to fly and last longer.**

One of the models planned by a manufacturer for post-war production is the Piper Aircraft Corporation's model P.T.-1. This model,

Bell Aircraft will manufacture this helicopter for private and commercial use after the war.

Tomorrow's Business Trips by Lightplane

—Courtesy Piper Aircraft Corp.

at present an experimental trainer, will be the forerunner of a medium high performance airplane for the private owner. It will accommodate four persons comfortably without crowding and have a cruising range in excess of 600 miles at a cruising speed of from 135 to 150 m.p.h. The present version of this PT-1 model is of low wing design and has a retractable landing gear.

The Sky's The Limit

FOLLOWING the war there will be a development and expansion of airplanes and airways that will dwarf the corresponding age of the automobile after the last war. The C. A. A. estimates that 500,000 commercial, private, and military planes will be in service before 1945; and even a greater number of luxury liners, giant transports, and a multitude of smaller family models and helicopters will fill the sky in the years after the war.

Tomorrow all of the principal cities of the world will be linked by direct air lines. A vast system of main and secondary feeder lines will make it possible to travel by air from virtually any spot to any other spot in the world.

Pan-American, for example, plans to put into service 50 giant clippers between New York and London. Each plane is planned to be capable of carrying 153 passengers between the two cities in 10 hours at a cost of $100. Other routes by clipper to China, across the north pole to Russia, to Europe, and to South America are already in operation or planned.

Willys-Overland uses one of their Jeeps as a pumper to fight fires in narrow factory areas.

On the greater part of these routes, the new luxury liners will be land planes. The DC-4 and the DC-6 have already proven the practicality of using land planes not laden with the clipper's heavy hull. The DC-4 will carry 44 passengers and a crew with mail and express at a cruising rate of 239 mph, while the six-engined DC-6 will carry 55 passengers and crew at 334 mph. These planes had already been built for the major lines when they were taken over for war use. Since then they have proven their worth on the famous "Cannonball" run between India and China, and are also making regular flights across the Atlantic and Pacific Oceans. In doing the former, they have proved that the North Atlantic route can be flown safely in both summer and winter.

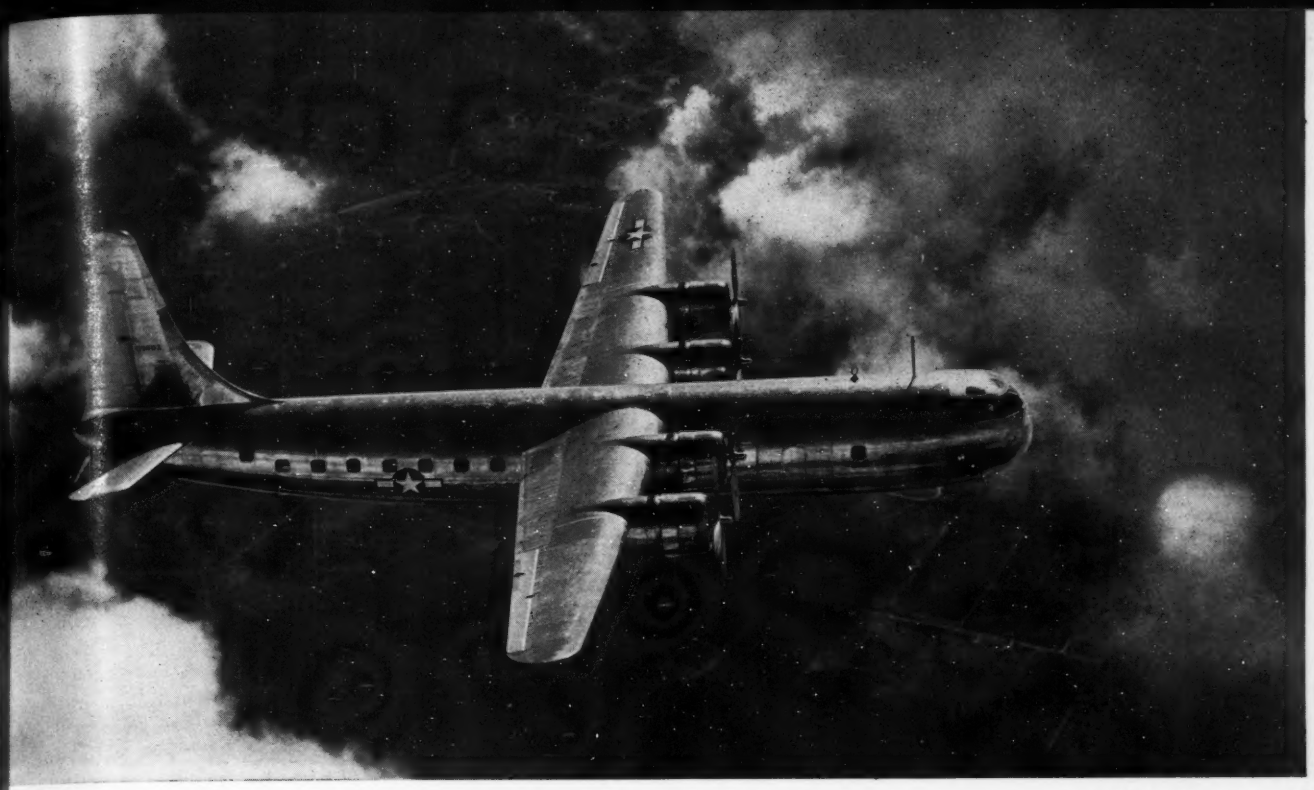
The Chicago and Southern Airline is planning a 100 passenger plane, with a crew of 28, equipped with radar, television, and other comforts for the traveler. The British have also designed a series of luxury planes, one of which will carry 55 passengers at a speed of 250 mph. Colonial Airways has had Burnelli make plans for the long heralded "Flying Wing", capable of a speed of 250 mph and a range of 2000 miles while carrying 40 passengers. All types of design will feature more comfort, arranging the seating in either coach or divan—berth style.

Secondary feeder lines may use the helicopter. Such lines have already been planned by the Greyhound Company, and it has obtained franchises for several such routes.

Railroad Saga

THE American public will see a rapid change in the Iron-Horse of the past. After the war there will be an almost complete "Dieselization" of American railroad service. There will, however, be something unusual about the change. The new locomotives *have been seen* by the American people (the Burling-

The strength and economy of plywood, as used in this plane, makes it a desirable material for post-war private plane production.
—Courtesy Iowa Engineer



—*Courtesy United Aircraft Corp.*

The Consolidated Liberator Liner (above), uses the same wing, engines and propellors as the B-24 bomber. It will accommodate 48 passengers.

ton Zephyr was the first brought to the public in 1933 and was an immediate success), but they were not used to the extent that they will be used in the post-war future.

The Diesel-electric locomotive was fully developed in forms to cover every class of service and was used in every class on leading mainline railroads of the United States a year before Pearl Harbor. The Diesel locomotive, therefore, stands as one of the tools of the "new era" that does not have to wait for a post-war development or conversion period, but is ready to begin progressively flowering into its full usefulness—a usefulness the scope of which is perhaps beyond the imagination of those capable of comprehending railroad service only as we know it today. Fully applied, the Diesel-electric locomotive is one key to the whole new conception of the mass movement of people and goods.

There are many economies in the operation of diesel-electric locomotives; such as, the saving of fuel, the decrease in the number of supporting services, and the cut in the cost of maintenance which will show immediate results as far as the rail passengers are concerned. Economy of operation will allow many railroads to continue service on suburban lines on at least a break-even basis and thereby bring the convenience of rail communication to many who would need to seek other transportation if railroads were positively a losing proposition.

Plans are being made to make use of Diesel-electric motive power on existing suburban or light-weight coaches. Both single car and multiple unit trains will be run by Diesel regardless of whether they are on the main line or not. Actual applications of designs of branch-line and suburban equipment for the purpose of service tests and analysis have been held up by present conditions. Designs have been drawn up for the improvement of the power-weight and the size-weight ratios of mainline freight and passenger locomotives and also light-weight suburban equipment.

The Missouri Pacific Eagle
—*Courtesy Electromotive Div., General Motors Corp.*

Much technical work has been done on the improvement and efficiency of the steam-type locomotive. Some progress has been made by locomotive designers with refined boiler designs with mechanical improvement of the pistons and valves, and in the use of powdered and briquetted coal as fuel. All this research points to a greatly improved post-war steam engine, and a good competitor of the Diesel-electric engine on rail lines which are reluctant to make the change.

The railroads are staking the success of their post-war travel business on faster trains, lower fares, and above all an enormous improvement in passenger comfort. The railroads are looking for the best in lightweight equipment so that they may be able to put in a bid for a share of the passenger traffic along with others in the transportation business.

Both deluxe sleeper and coach service are being planned by nearly

(*Continued on page* 52)

Post War Expressways

By GILMORE D. CLARKE '13

Dean of the College of Architecture

A GREAT deal has been written about post-war public works planning but, except in a half dozen of the states, relatively little has been done about it. Those who have given careful thought to the employment problems which are likely to confront this nation in the period during and immediately following the demobilization of the men in the Armed Services and in war industries recognize the fact that business, industry, and agriculture will probably be unable to provide jobs for all of those who are richly entitled to them following the cessation of hostilities. A WPA, or a dole, or a Beveridge Plan will not be acceptable to these men and, unless we have extensive public works plans ready to put to immediate use, we shall repeat the wasteful experiences of the depression days which occurred prior to the War.

Programs of carefully planned public works projects, to serve as a supplement to, not as a substitute for private enterprise, have been carried out by certain farsighted public officials in a number of states and in a few of our large cities. If we do not plan now for the post-war years, we shall probably have another shamefully wasteful WPA. New York State, among the states, and New York City, among the large cities, have taken the lead in the preparation of plans for post-war public works; the total estimated cost of projects already planned, or in the plan stage, exceeds one and three-quarter billion dollars.

There are many important fields in which post-war public works plans may be developed; they include housing, parks, public buildings, airports, harbor facilities, and motor arteries. This article will endeavor to describe the expressway, a form of motor artery, since by means of its development, employment may be provided for men of many varied industries and trades, and because it is an area in which the engineer may play a singularly important role.

The highway, as we know it, is out of date. In the future, through arteries connecting large centers of population will be designed as expressways rather than as highways. They will be insulated from the border lands, much in the manner of the railroad right-of-way, by strips of land along each side of the roadway, over which the owners of abutting lands will have no right of access. The following principles set forth standards which should obtain in the design of the expressway.

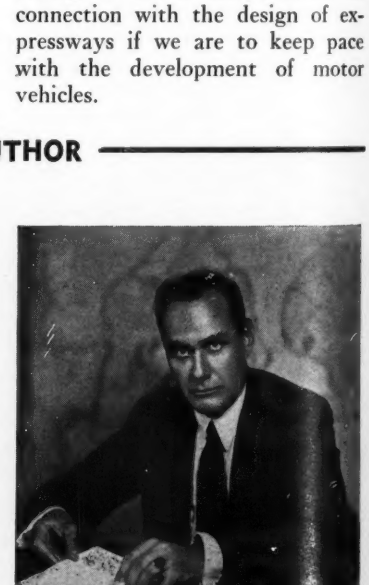
In order that an expressway may exert the best possible influence upon abutting lands, the areas between the express roads and the service roads should be graded and planted much in the same manner as obtains on a parkway. Hereafter the highway engineer will give greater attention to those factors which improve the appearance of all motor arteries, for almost every element introduced into the design of the expressway which improves the appearance, also improves the efficiency and the safety. For example, long tangents are more dangerous for traffic than long, easy spiraled curves; in the interest of safety, "roller-coaster" profiles, the result of building long tangents in rolling or hilly country, are better omitted; tangents between curves in the same direction, creating so-called "flat wheeled" curves, are undesirable; all structures, including bridges, should be carefully designed with due regard for the aesthetic as well as for the more practical engineering factors. These and other important considerations should be taken into account in connection with the design of expressways if we are to keep pace with the development of motor vehicles.

THE AUTHOR

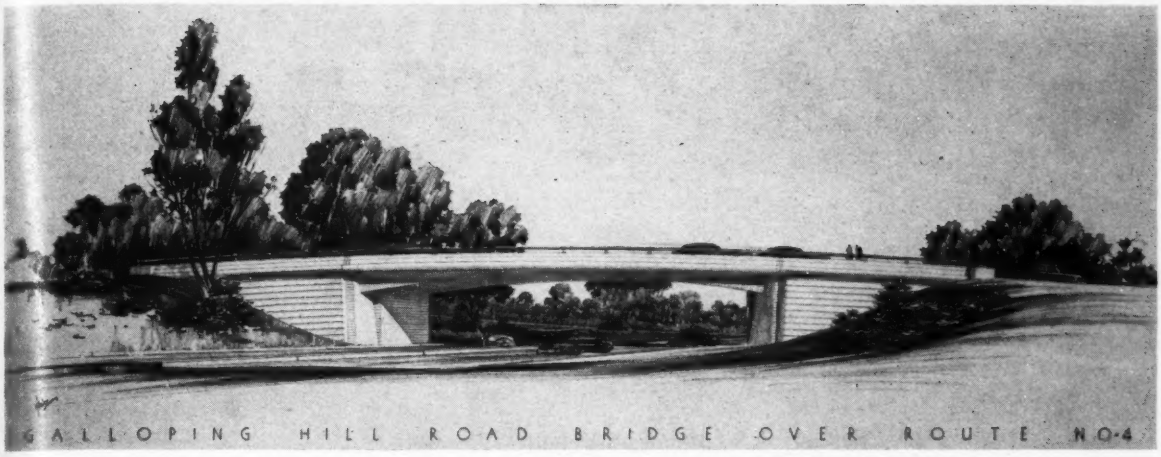
Dean Gilmore D. Clarke received a degree of Bachelor of Science from Cornell University in 1913. After a brief stay in the business world, he entered the Army and was a member of the Engineer Corps in the A.E.F.

At the termination of the War, he was appointed Superintendent of Construction of the Bronx River Parkway in New York City and Westchester County. Following this, he was Consulting Landscape Architect for several government projects.

He has been Professor of City and Regional Planning at Cornell University since 1935. In July of last year, he became Dean of the College of Architecture.



Gilmore D. Clarke



Reinforced concrete rigid frame bridge carrying six-lane expressway over intersecting highway. Designed by Clarke, Rapuano & Holleran, Consulting Engineers.

Width of Right-of-Way

The width of the right-of-way should be sufficient to provide for (a) a separated pavement of four or six 12-foot lanes (depending upon the predetermined traffic volume), two or three for traffic in opposite directions; (b) a median strip of variable width (6-foot minimum); (c) width for deceleration and acceleration lanes at points of access with intersecting arteries; (d) wide, flat slopes; (e) ramps; (f) walls; (g) service streets, where necessary; or such of these facilities as may be required at any particular point. In any case, the right-of-way should be of a minimum width of 200 feet, where service roads are not required, and a minimum of 300 feet, including service roads, where such roads are necessary.

Number and Width of Traffic Lanes and Median Strips

The width of the pavement is dependent upon the anticipated volume of traffic which the route will be called upon to carry. Three lanes for traffic moving in each direction, a total of six lanes, is the width necessary on urban projects expected to carry an average daily traffic of 20,000 or more vehicles. Each lane should be 12 feet wide, making the total pavement width 72 feet; the two roadways, each made up of three lanes, should be separated by a median strip of variable width but of not less than 6 feet. In rolling topography, or where it is necessary to construct expressways on side slopes, the roadways may be separated for wide and for varied distances so that one profile may be at a higher elevation than the other, the median strip taking up the difference in grade by providing adequate shoulders along the two pavements with a one on two slope between.

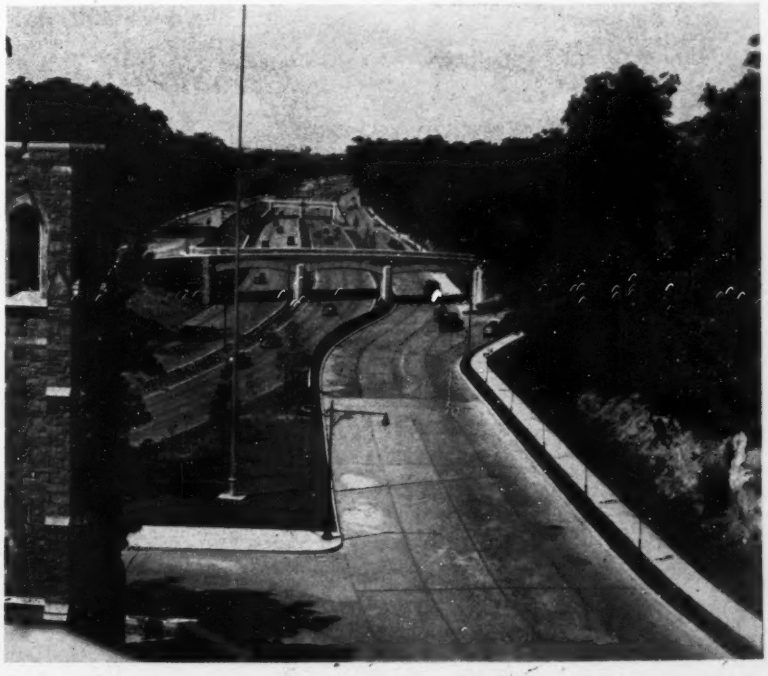
Shoulders, Accelerating and Decelerating Lanes

Shoulders 10 feet wide should be provided on one side (outside and to right) of each roadway. Thus the graded width for the pavement (6 lanes), the minimum median strip (6 feet), and two 10-foot shoulders total 98 feet. The shoulders are necessary for the temporary accommodation of disabled or other stationary vehicles, and they should be provided for the full length of the project. Curbs separating the outside lane of pavement from the shoulders should not exceed 6 inches in height and should be sloped so as to be mountable.

In built-up sections, service roads may be required along each side of the right-of-way. These will facilitate exit from and entrance to the expressway. They should be designed 30 feet in width to provide for one lane of parked cars and two moving lanes of traffic. In thinly populated sections the service roads may be narrower. Slopes between

(*Continued on page* 44)

Depressed six-lane parkway with bordering service streets is incorporated in Henry Hudson Parkway, New York City.



COMMUNICATIONS—

Edited By RICHARD E. GOLL, V-12

Future Television

TELEVISION to the every-day man is still a laboratory experiment. However in the post-war period television will expand until it will eventually be on an equal level with today's radio. Large steps will be taken to accelerate this trend immediately after the war.

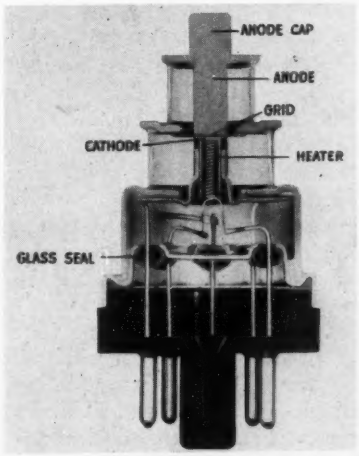
Probably the greatest asset that television has is its amazing versatility. Countless tests on various different fields are constantly being given to determine its adaptability to that particular job.

One of the certain uses of television after the war will be the covering of daily news. Experiments have already been conducted in this field with very satisfactory results. One of these experiments was run in Schenectady, New York, by General Electric, as a typical example of what the future holds in store for the television set owner. The beginning of the program was devoted to the televising of the actual newspaper pages, which included the classified pages as well as the war news. To supplement this a news broadcaster gave a short resume of the war news with the aid of maps and charts. Brief programs of wit, finance, cartooning, and styles were also included in the program.

Expansion of television as an industry will be helped by the fact that technical advances allow more widespread geographical coverage.

Workers will find television an able and effective instructor in job training. Crews manning ships or planes will be able to determine their positions regardless of weather conditions. Advertising will take on an entirely new aspect by working hand-in-hand with television to show new products to millions of people and giving easy-to-learn visual directions. Television will revolutionize education. It will bring the world into schoolrooms... show a complex laboratory experiment to millions . . . let thousands watch a skilled artist at work . . . take the contents of museums and art galleries into a million homes at once. Wherever distance and obstructions limit man's eyes, television is ready to provide a new and stronger "second sight." At the present time only relatively small distances (about 100 miles) can be covered by television. This is due to the inability of the waves to bend over the contour of the earth. To break this restriction, relay stations have been designed which pass the impulses on to other receiving stations. In the post-war world this small network will grow until it practically covers the entire U. S., bringing television to everyone.

Of course rapid advances are being made in the perfection of the picture itself. These advances will show themselves in your post-war model. One of the new features will be the ability to televise objects which are under ordinary illumination. The prewar model required strong artificial lighting effects for indoor shooting; and outdoor shooting was obtained only at the expense of fuzzy, unclear pictures. With this advantage the post-war machine will bring a clear, concise picture of formerly hard-to-take events into the homes of millions of Americans. Along with this improvement in lighting conditions will be opened the amazing field of color television. Whole new regions of the spectrum will be available to practical and eventual peacetime use. Thus, right before your own eyes, you will be able to see the battle for a World-Series pennant or an All-Star football game with all the comforts of home.



—*Courtesy General Electric*
"Lighthouse" Tube

Actual "guinea pig" audiences are being shown drastically different types of programs in order to obtain their reactions. These experiments are being tried to make certain that the post-war world will be getting programs which they enjoy. Present indications show that light opera is the favorite. This choice might change after the war, but whatever be the demand of American people, television will be there with clear, thrilling pictures.

"Lighthouse Tube"

A new radio tube, to be released after the war, will advance the frequencies and power available for use in the electronic field greatly. Even now it has made possible a large new family of ultra-high fre-

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Coated nside with phosphors, glass globe lights when electronically bombarded with light frequency radio energy.

—*Courtesy Westinghouse*

Walkie-Talkie will help fight fires. *—Courtesy R.C.A.*

quency electronic tubes, circuits, and apparatus which operate in parts of the spectrum not used before the war.

This achievement will permit production of efficient FM radio and television relay systems which will help make possible quick postwar expansion of those services. It will bring about for the first time the production of medium and high-power television transmitters which will be able to operate in the very high frequency bands. It will provide room for the expansion of radio navigational aids of all kinds; directional and ranging devices applicable to mobile services, and numerous medical and industrial applications of electronics.

The design, as illustrated on the previous page, permits an extremely compact overall tube structure which is capable of withstanding severe jolts.

Walkie-Talkie

MILITARY needs have brought such advanced developments in radio communication that firemen and policemen in the postwar period may be equipped with walkie-talkies to fight fire and crime with radio. Through the same medium, doctors may keep in touch with offices and hospitals, and operators of trains, buses, taxis, and trucks would receive their instructions from headquarters while on the move.

The size of the radios will be such that they will be easy to carry and handle. A fireman in a blazing building could receive instruction from an outside officer.

The walkie-talkie radio system will tend toward the use of higher frequencies in the radio spectrum. The use of such higher frequencies will result in lower-powered transmitting equipment, smaller apparatus, and more efficient antenna systems. A higher frequency system also will more readily cover the exact areas desired and result in the availability of a larger number of transmission channels.

New Oscillograph

As a new electronic oscillograph to record electrical phenomena, Westinghouse has developed a redesigned, stream-lined machine which should eliminate fuzziness and distortion common in the older types. The reason for this improvement lies in the fact that this machine is capable of recording electrical phenomena lasting as little as a fraction of a millionth of a second. The use of this instrument has greatly increased in its 14 year growth until now new industries, especially aircraft, have found extensive use for it.

The principal improvements in the new, streamlined version are conservation of space, sectionalizing into functional units, and a photo-electric control for exposing a film rotating on a drum. This control insures that the film always will be exposed for one revolution only, although the drum speed is variable within a wide range up to 7000 rpm. The latter feature was developed to

(*Continued on page 62*)

This new electronic oscillograph is ready to meet industrys' demand for undistorted records of electrical phenomena. *—Courtesy Westinghouse*

Developments in Communications - I

By WALTER R. JONES, E.E. '25

Manager of Commercial Engineering, Sylvania Corporation

THE Second World War might truly be called a War of Communications. By means of communications, it was possible to see and hear the enemy as well as to keep in touch with our own men and equipment. In the First World War radio was only an infant, and communications at that time depended largely upon land wires for telephone and telegraph. The impetus which that war gave to radio was demonstrated in the rapid rise of the radio broadcasting industry. As large as that development was, it is probably insignificant compared to the impetus the Second World War will give to the whole communications field.

Let us now look at the glamour children which were born in this war. The first of these is radar. Radar has been very successfully used to locate objects which are well beyond the horizon and which can not be seen or located by other existing means. It is quite likely that active work will be carried on employing radar principles for signalling devices between ships, railway trains, automobiles, trucks or any moving objects.

Frequency modulation, which had begun to appear as a new type of broadcasting prior to the war, has been given many tests and has been refined to such a point that it has supplied very reliable means of communication over considerable distance with great reliability. The reduction of "man-made" interference by this method of transmission appears to have been very valuable in the war where so much "man-made" interference is normally present. It is doubtful whether much of the intercommunication which has been carried on in this war could have been as effective if frequency modulation had not been used. The stimulus given to this type of broadcasting has resulted in an unprecedented demand for F-M station licenses. It is predicted that radio receivers will sell for less than $100 capable of receiving both standard broadcasting and frequency modulation broadcast signals.

At the present time fidelity of chain broadcast programs is limited by the characteristics of the telephone line which carries the modulation frequencies to the network stations. The use of completely automatic relay stations employing frequency modulation to transmit signals from the originating stations to the various member stations of the network will result in improved fidelity and probably lower cost of transmitting programs. A coaxial cable has been laid by the telephone company between some cities and this also will permit higher fidelity transmission.

It is expected that not only will ship-to-shore communication be speeded by these automatic relay stations, but that communication between moving trains and even moving automobiles may be an assured fact, and that it will be possible to communicate by telephone even when travelling in a train, airplane or private autmobile.

Longer Recordings

Considerable improvements in methods of recording programs have been developed as a result of the war so that a complete evening's entertainment may be enjoyed by means of the radio-phonograph combinations which will soon appear. Many improvements in recording on the conventional records have been made. Numerous other methods, such as recording on wire, have been perfected so that many hours of continuous music may be enjoyed with very little attention being given to the unit itself. Elimination of needle scratch will be particularly noticeable as these new devices begin to appear on the market.

For many years the hard-of-hearing have been confronted with the problem of making a very large investment in order to obtain a hearing-aid. Attempts have been made to place this device in quantity production with a great reduction in

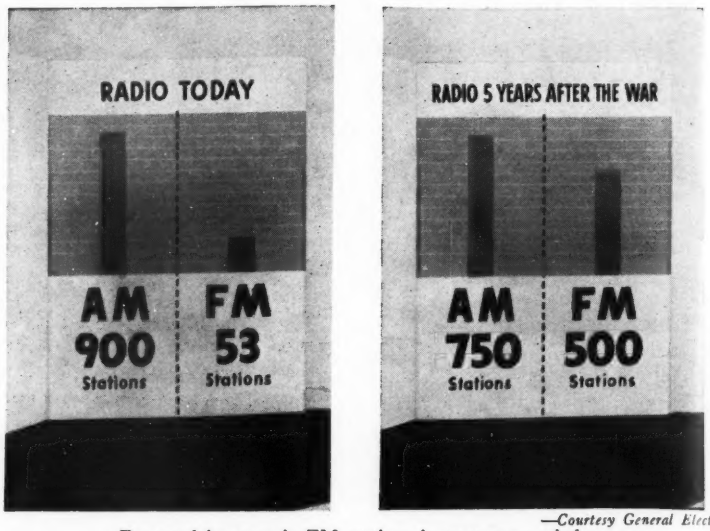
THE AUTHOR

Mr. Walter R. Jones graduated from Cornell University in 1925 with a B.S. in Electrical Engineering. He immediately joined the Federal Radio Company, where he was in charge of the Testing Department. Later he transferred to the Research and Development Department. In 1929 he joined the Sylvania Corporation in Emporium as a sales engineer. He continued in that position until 1939 when he was appointed Manager of Commercial Engineering, in which capacity he serves at the present time.

Mr. Jones

cost to the user. If these units are properly fitted, many thousands of people, who are unable to hear, will be able to afford such devices and once more enjoy hearing.

The last, and perhaps one of the most important and spectacular glamour children of the war, will be television. Before the war television programs were broadcast in a relatively few metropolitan areas. It is expected that these areas will be greatly expanded and that within a few years most metropolitan centers will enjoy television programs. The rapidity with which television will spread depends upon several economic factors. In the first place, cost of production is high. It will cost several times as much to put a television program on the air than is now spent on that same program for sound broadcasting only. This means that the expenses will be greater and probably the cost to the advertiser will be correspondingly increased. If, however, sufficient market can be developed in the form of receiving equipment, then the cost of getting the message across per person will not be prohibitive. It is predicted that television equipment employing tubes of the 9-inch or 10-inch size will be available to the public at about $125. Projection type equipment, which employs a smaller tube, and which will project pictures approximately 18 by 24 inches upon a screen, will probably be available at prices something under $200. Before the war it was necessary to pay between $400 and $500 for such equipment. If this equipment can sell in the price range quoted above, it is predicted that several million receivers will be sold in the five years immediately following the war. This will increase the television market greatly and expand its possibilities so that it may easily become the leading part of the present radio entertainment field.



—Courtesy General Electric

Expected increase in FM stations in post-war period.

Proposed post-war television network.

—Courtesy R.C.A.

At the end of the First World War we stood upon a threshold of a new but relatively untried venture—radio broadcasting. As this war nears its conclusion, the possibilities for communication expansion along entertainment lines, as well as service lines, appear to be enormous since the new possibilities have actually been developed to a considerable extent during the present war. Thus, within a very short time, electronics in the communication field should be expanded at an enormous rate.

Spanning The Ocean

TRANSATLANTIC communication by means of submarine telephone cable will receive considerable attention from the Bell Telephone research department after the war. The present transatlantic system of telephone communication by radio transmission has certain distinct disadvantages which will be eliminated by use of a cable. Some disadvantages are as follows: radio channels are not available in unlimited numbers, radio transmission is subject to interruptions by magnetic storms, and the significant feature of privacy is very difficult, if not impossible, to safeguard. Closer relationships with Europe, following the war, will require expanding the present facilities of communication.

The post-war transatlantic cable will use distributed repeaters constructed in such a way that no attention to them would be required over a period of years.

Developments in Communications - II

By C. A. PRIEST

Transmitter Division Manager, General Electric Company

AFTER the shooting stops; after the din and confusion of war dies away; after the tremendous cost of lives and money is counted, there remains the task of picking up the pieces and salvaging from the enormous waste as much gain for the human race and particularly for our country as is possible. Two industries due to benefit directly and spectacularly from work done during war time are the closely related ones of transportation and communication. Perhaps the developments in communications are less spectacular to the layman, but to one interested in the field they are none the less real and perhaps even more valuable than those in transportation. A brief assaying of some of the possibilities of postwar improvements in communications may be useful at this time.

Very roughly the communication field may be divided into three classifications:

a. Common carrier public service
b. Home entertainment
c. Military and police use.

Each of these classifications may be further subdivided, but the result would be merely a catalog without real purpose. Let us then examine some of the tools that war has caused to be intensively developed and attempt to foresee where these tools will be applied to increase the utility or efficiency in each of the broad classifications.

The first and undoubtedly the greatest development as a result of war work has been the broadening of the radio frequency spectrum. Prior to the war the highest frequencies in use to any appreciable extent commercially was the 42 to 50 megacycle band used for FM broadcasting. Higher frequencies were used for television to a limited extent and even higher ones for airplane communication in a preliminary way, but now we quite glibly talk in tens of thousands. This sounds as if there would be frequencies available for every possible use, but I assure you this is very far from the actual case since necessary uses of radio have expanded faster than the expansion of the spectrum. The Radio Technical Planning Board, which was set up by the radio industry and with the cooperation of the Federal Communication Commission, under the chairmanship of Dr. W. R. G. Baker, has been studying these questions for many months. These studies clearly show the need for many more communication channels than can possibly be gotten in the well explored part of the spectrum and it seems clear that the F.C.C. will have to force every possible service into the war developed part of the spectrum in order to make way for expanding services which must, because of technical reasons, remain in their present bands.

The heart of any new development in radio is the vacuum tube and this is particularly true in expansion of the spectrum. Work in development of new types of tubes and improvement of old types has produced literally hundreds of types, whose characteristics and performance are shrouded in military secrecy and many of which will be of little value for communication purposes. An entirely new class of tubes and one potentially of greatest value for communication work is the plane electrode tubes with very small dimensions. These plane electrodes can be placed very close together, thus achieving the lowest possible transit time and hence having the highest possible upper frequency limits. Coincidental with the development of this class of tubes has been the development of resonant line and cavity types of circuits which permit obtaining maximum efficiency at frequencies far above the limits of the convential lumped constant type of circuit.

These developments will permit the practical design of high frequency relay links using unattended relay stations at spacings of twenty-five to fifty miles which seems to be the only practicable method of obtaining wide distribution of television programs. Preliminary studies seem to indicate that this type of radio relay may be

(*Continued on page* 50)

THE AUTHOR

CONAN ALTHADO PRIEST

Mr. Priest graduated from the University of Maine in 1922 with a B.S. in Electrical Engineering. He entered the Engineering Division at the General Electric Company and worked in the Radio Department. In 1927 he left the United States for a year's service with the International General Electric Company in Japan. On his return he was appointed Assistant Engineer of the Transmitter Division and was made Engineer in 1930. At the present time Mr. Priest is Manager of the Transmitter Division of the General Electric's newly founded Electronics Department.

Mr. Priest

MATERIALS—

Edited By BEN-AMI LIPETZ, ME '47

Plastics

THE plastics industry is probably the most widely publicized industry of our time. So many different plastics have been developed, so many uses for them have been found, and so many more have been predicted, that many people regard plastics as universally applicable materials. Actually, while plastics can be used over a very large range, they have found their largest uses as specialty applications in fields where their inherent properties make them superior.

One outstanding wartime achievement in plastics was the development and large scale manufacture of synthetic rubber. Although some synthetic rubber such as DuPont "Neoprene" and Goodyear "Chemigum" were in limited industrial use before the war, it was not until recently that synthetic products were produced which would completely and satisfactorily replace natural rubber. The post-war status of the synthetic rubber industry when the cheap natural rubber sources are reopened is still uncertain; it is probably safe to predict that synthetic rubber will continue to be used wherever its superior qualities are of value.

The various brands of synthetic rubber which will become available after the war are comparable to natural rubber in almost all respects, and in some cases have been found even more desirable. Neoprene, for example, is practically unaffected by sunlight and does not tend to crack like ordinary rubber. Its high resistance to heat, oil and chemicals are also highly advantageous for many applications. The Goodyear Tire and Rubber Company has developed a new thermoelastic rubber, "Plioflex," which can be vulcanized.

The B. F. Goodrich Company has developed several vinyl resins which can be plasticized into rubberlike products with exceptional properties. These resins and plastics go under the name "Geon", and are derived from limestone, coke, salt, water—all cheap domestic raw materials. Although normally themoplastic, Geon resins may be vulcanized upon the addition of certain polymers. Compounded Geon resins may be calendered, extruded, molded, cast, or used for surfacing or impregnating. They are noninflammable, and may be satisfactorily employed at temperatures up to 375 degrees Fahrenheit. Among the applications of these plastics are wire insulation (the Geon is molded right onto the wire), synthetic leather in shoes and luggage, small utensils and industrial parts, upholstery, hose, and coated fabrics for a multitude of uses.

Another DuPont product, polythene, has found similar applications and can also be used for collapsible tubes such as toothpaste comes in. "Loalin", a polystyrene molding compound produced by the Catalin Corporation, is expected to find important uses in electrical insulation.

Nylon Products

DuPont "Nylon", usually associated with hosiery and fabrics, has found many important uses in other forms. Nylon bristles have been used in toothbrushes since 1938. Recently Nylon has been used in place of pig bristle in paint brushes. The Pittsburgh Plate Glass Company is also making synthetic bristle brushes of their own product "Neoceta." Window screens made of Nylon strands are expected to replace metal mesh. The plastic is superior to metal in this application because it is strong, elastic and corrosion proof. Nylon rope, which is stronger and more elastic than other ropes, has made it possible for tow planes to pick up gliders or airmail on the fly.

Westinghouse has developed a new synthetic resin which is superior to shellac. It has all the electrical and mechanical properties of shellac, and in addition is stronger and more elastic. Bonded with fiber-glass it is stronger than cast iron. It is moisture proof and cannot be dissolved in any known solvent.

—*Courtesy B. F. Goodrich*

Light, transparent "Koroseal" coatings make paper or fabrics completely waterproof.

"Fosterite" is another Westinghouse resin which combines great strength with formability. It is being used with good results as a coating for electrical equipment.

Laminated and reinforced plastics give great promise for the future. "V-Board", produced by the

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The Shape of Things to Come. Nylon bathing suit by Du Pont.

—Courtesy U. S. Rubber Co.

A 400 foot synthetic rubber belt conveyor. Synthetic rubber belting is now scheduled for mass production.

United States Rubber Company, is a versatile fabric—reinforced thermosetting plastic. It is comparable in strength to many metals, and is lighter than aluminum. Brilliant decorating effects may be gotten by using a clear surface over colored reinforcing fabrics. "Micarta 444", a laminated phenolic plastic put out by Westinghouse, is a very light material which can be drawn deeper in hot forming than most other plastic laminates.

Transparent plastics such as DuPont "Lucite" and Rohm & Haas "Plexiglas," in fairly common use before the war, are expected to find even greater usage during the post-war period. Not only are these plastics delightfully decorative (especially when end-illuminated), but they have important industrial applications in protective shields.

Synthetic Fibers

THE textile industry will experience a marked change after the war when synthetic fibers become available for civilian use. DuPont "Nylon" yarn, which before the war was used mainly for hosiery, will probably be available at less cost after the war and will be used extensively in sewing thread, cordage, bathing suits, curtains, upholstery, drapery, rugs, etc. Among the advantages of Nylon fabrics are the large variety of finishes they can be given, their retention of shape during washing, their ease of washing, crush resistance, and moth resistance.

The Celanese Corporation of America has also developed a high tenacity, light-weight yarn, called "Fortisan", which is said to be stronger than any other yarn. It can be used for clothing and home decorating, as well as for webbing, belting, and tire cords in industry.

Owens - Corning's "Fiberglas" promises many post-war uses. Although pure glass fabrics are not recommended for applications involving severe or continuous strain, they become more flex and tear resistant when coated with synthetic rubber or resins as Goodrich has done with Geon coatings. Weaves combining glass and cotton are being experimented with as reinforcement for plastic laminates. Glass fabrics are especially useful where fire, acid, or oil resistance is required. Fiberglass can be used for wall insulation in the form of glass wool or compressed fibrous board.

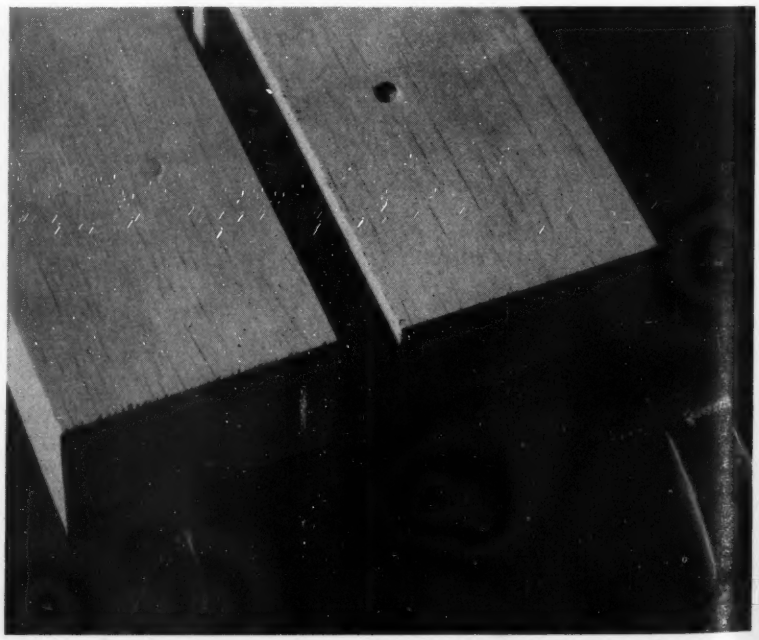
Treated Wood

A new process which transmutes soft pine wood into a material as hard as maple, and which makes maple as hard as ebony has created a multitude of new uses for wood in the post war period. The process, announced early this year by DuPont, involves the impregnation into the wood of "Arboneeld" (dimethylolurea) to react with the components of the wood and form a resin which makes the wood durable.

So radically does the treated wood differ from the untreated stock that it is virtually a new material. Natural tendencies to swell,

Treated and untreated wood blocks after a "C" clamp hardness test. The methylolurea-treated specimen is on the left.

—Courtesy DuPont Company



shrink or warp with changing humidity are eliminated. A "built-in" finish is imparted throughout the wood, so that it may be given its final dimensions and its surface finish in a single operation. By mixing a colored dye with the processing chemical, light colored pine can be impregnated through and through with the hues of cherry, rosewood, or mahogany, or with brilliant reds, greens, or purples. At the same time the wood is made stiffer, harder, and more resistant to flame, rot, surface wear, and chemicals. It may be strengthened and hardened still more by compression after treatment. Sawdust, shavings, cotton, leather, paper, and certain farm wastes may be treated by the same process and molded into useful articles.

Possible post-war applications for treated wood include boats, furniture, flooring, veneers, machine parts, sporting goods, office and store equipment, cabinet work, blinds, tool handles, vats, tanks, and agricultural equipment.

Heat Processing

THE principle of high frequency electrostatic heating is not a new one but the development of Thermex by the Girdler Corporation was the first application of the principle to industrial heat processing of non-metallic substances.

In this process the electrical energy from the electrostatic heating acts on the molecules of the substance, causing them to change shape. These rapid changes caused by a reversal of the electric field several million times a second result in a tremendous amount of heat due to molecular friction.

There are two general uses for high frequency electrostatic heating: to heat non-metallic materials uniformly and at a rapid rate, and to bring about chemical reactions. It is used in drying paper and results in a marked reduction in the necessary time; in the same way the drying time of textiles after dying or treating can be shortened. Felts, wools, clays can be dried quickly and uniformly. Oxides such as carborundum are readily heated by this method. Large quantities of water can be removed from tobacco in a short time. It is used in the setting of plastics, softening of rubber, celluloid, wood fibre, wood, as well as fibre glass and similar products made up of many individual pieces held together by a plastic. A recently discovered use is in the destroying of infestation in grain and cereal.

Cellophane

IN prewar days we connected the name "Cellophane" with gifts, Christmas packaging and the like, but today this derivative of wood pulp is playing an important part in replacing tin, rubber, and metal foil for the packing of foods. At present Cellophane, a DuPont product, is being used inside of paperboard cartons to replace tin-lined steel cans. In these are packed frozen eggs, lard, vegetable shortening, baking powder, vegetables, coffee, and even fruit juices.

Because it can easily be heat-sealed and has been found to keep foods of all types fresh for several months it seems plausible to predict that Cellophane will find varied application in the post war world.

It is also used to protect precision instruments, in transit from rust, dust, and corrosion, which might prove extremely injurious where close tolerances are involved.

Pliobond

FAR reaching post-war improvements in the design of building interiors, homes, airplanes, automobiles, railway cars and ships are anticipated as a result of a new development in wood-to-metal bonding materials. Through the use of "Pliobond", a rubberlike adhesive produced by the Goodyear Tire and Rubber Company, wood sheets as thin as one forty-eighth of an inch can be successfully cemented to metal surfaces. The bonding process is completed in 15 minutes using heat and moderate pressure.

A meal sheeting, thus covered with wood, has the surface beauty of wood, but retains the mechanical properties of the metal. It may be bent, stamped, or cut with a shears without causing the wood to crack or tear loose. A lighted cigaret placed on the wood does not scorch it because the meal conducts the heat away too rapidly. Other metal units may be welded to the back of the sheet without harming it.

Wood to metal bonding was known before the war, but it involved a much more complicated process and required now unavailable tin.

Furniture made of wood-finished

(*Continued on page 54*)

—Courtesy DuPont Company

A few of the many applications of Nylon—sheeting, insulation, rods, tubing, rope, screening, etc.

Materials Tomorrow

By J. O. JEFFREY

Professor of Engineering Materials

ON October 3, George C. Heikes, Director of W.P.B.'s aluminum and magnesium division announced that all government controls on the use of magnesium had been removed. Last winter, we read with considerable amazement, that the production of aluminum in one of the East's new manufacturing plants was to be suspended, because our aluminum capacity had already exceeded the demands of the aircraft industry for war purposes. Copper production is now so plentiful that the Ordnance Department has returned to the use of brass shell casings instead of the substitute, steel. As a matter of fact, the only metal that is scarcer today than before Pearl Harbor is tin—and tin is still very short. Only our prewar stockpile of this metal combined with effective economies in its use (especially in solders and in tin plating) have prevented curtailment in supplying essential military needs. Two years ago, the list of critical metals included nearly all the steel alloys, the light metals, and most of the other non-ferrous metals. Today, only tin and nickel are on the critical list. Regardless of one's political convictions, a tremendous amount of credit must be given to those members of the War Production Board who have stuck to their guns, in spite of strenuous assaults on all sides, in order that we might enjoy our present favorable position with regard to essential metals and alloys.

As a result of this and the hope that the war in Europe may come to a reasonably early conclusion, people are asking the question, "What will the situation be when peace finally comes? How can we consume this vast productivity?" It is true that there will exist a tremendous demand for products to replace those worn out since Pearl Harbor, and it is quite obvious that for about two years after V Day the attention of industry will be directed toward replacing such goods. It is also quite apparent that no spectacular changes will be made in the design or performance of such products. The immediate post-war automobile, refrigerator and radio will, no doubt, resemble very closely, if not exactly, the 1941 models.

In the field of ferrous metals, there will be many new steels. Because of the scarcity of alloying elements mentioned above, the steel industry has done a remarkable job in evaluating the specific effects of these elements on the properties of steel. Using the recently developed Jominy test for measuring the response of a steel to depth hardening, it has been found that the same response to heat treatment could be attained through the use of relatively cheap and plentiful manganese (assisted sometimes with molybdenum), as was formerly obtained through the use of such elements as nickel, chromium, vanadium and tungsten. These national emergency steels, as they are called, will constitute an important group of our alloy steels when peace returns, and will enable us to acquire the same high properties in our steels much more cheapely than was possible before. With nickel, chrome and tungsten released from this service, and with our tremendously increased electric furnace capacity, we will be able to produce more special-purpose steels, such as stainless steels, high speed steels and carboloy. The metallurgist's development of workable steels capable of withstanding high stress at elevated temperatures will contribute more toward making feasible jet propulsion for aircraft than any other single advancement in the airplane industry itself. When the properties and uses of steel are viewed in this light, it become apparent that neither the light metals nor the much-heralded plastics are going to seriously threaten the position of steel in the future.

In the field of non-ferrous metals, the greatest expansion has been in the light metals for aircraft. It

THE AUTHOR

A native of central New York, Professor J. O. Jeffrey attended college at Cornell and graduated from the mechanical engineering school in 1925. He was appointed an instructor of experimental engineering the same year. In 1935 he received an MME and was made an assistant professor two years later. He became an associate professor in 1941 and this April was advanced to professor of engineering materials. Professor Jeffrey is the author of numerous articles in engineering publications.

Professor Jeffrey

seems logical to believe that after the war this market will diminish to a small fraction of its present size, hence the utilization of our aluminum and magnesium productivity must be carried by other industries until the airplane business re-establishes itself. The railroads could do much to improve their mobile equipment by making lighter freight cars, coaches, locomotives and tenders. In the automotive industry, trucks, pleasure cars, buses and trailers can be redesigned to take advantage of the benefits accruing from lighter weight vehicles. Dr. Willard H. Dow, President of the Dow Chemical Company, recently said that experiments show that magnesium wheels will soon be standard on most automobile equipment. Other applications where light weight is desirable are for reciprocating parts, for portable equipment such as tools, cameras, vacuum cleaners, etc., and for flooring (especially bridges).

Aluminum enjoys a further advantage in that it is an excellent conductor of electricity, and it will compete with copper in this field, especially for long transmission lines where its use will permit placing the supporting poles further apart. Thin aluminum foil will be used for reflectors, and will offer a serious threat to other materials now used for insulating homes. Post-war aluminum alloys will be stronger and more corrosion resistant than any yet available for civilian use—these will compete with copper and steel sheet for roofing and other applications.

—Courtesy DuPont Company

Chairs seated and backed with durable Nylon, woven like rattan, promise interesting changes in the furniture field.

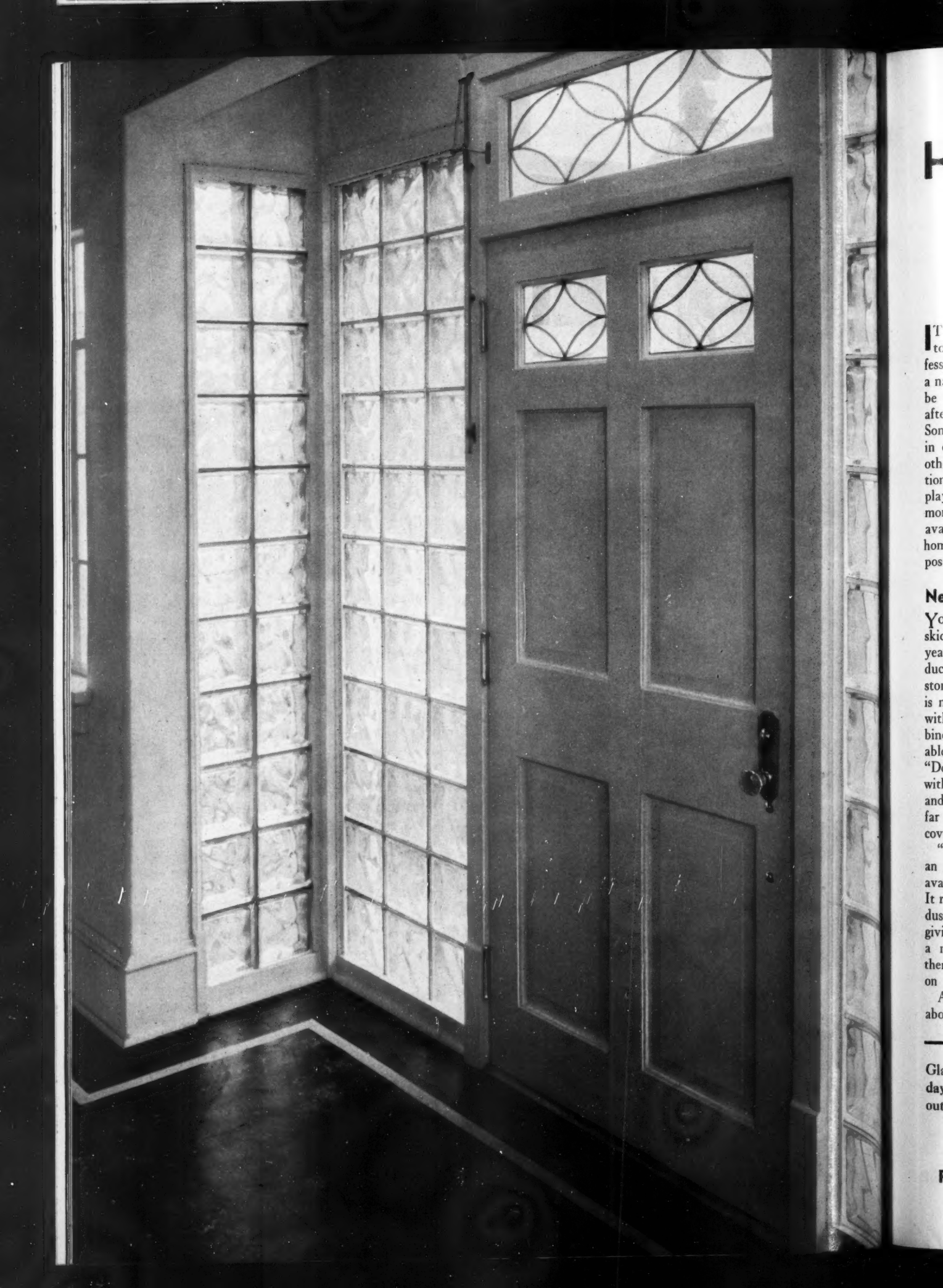
Copper in all probability will continue to be used after the war for substantially the same applications as before. Most of the substitutes for this metal and its principal alloys have generally been found to be inferior (except for electrical conductors). The obvious market for automobiles, refrigerators and radios, together with the expected flourish in the building industry, should provide adequate demand for our copper production, as all of these industries are heavy consumers. Copper-beryllium alloys are a comparatively recent development. As the cost of beryllium diminishes, these alloys will find greater application as tools, springs, gears, bearings, etc.

Plywood has found many wartime uses, such as training plane fuselages, which indicate increased peacetime use.

—Courtesy Haskelite Mfg. Co.

So much publicity and glamour has been given to plastics in recent years that many people are suffering from the delusion that plastics are about to relegate our metallic materials into a position of secondary importance. Nothing could be further from the truth. Used in conjunction with our metallic materials, the plastics play an important role in our present-day scheme of engineering materials, and their influence will doubtless be more prominent in the future than it is now. This position can only be sustained, however, if the same rigorous engineering analysis is applied to their design and application as is given to our metallic products. In the latter field, the ill-conceived

(Continued on page 47)



HOUSING—

Edited By RODERICK W. PEARSON, ChemE '47

IT is generally expected, according to a cross-sectional survey of professional opinions taken recently in a national magazine, that there will be plenty of new houses available after the war, for all price levels. Some of these will be "modern" in every sense of the word, while others will adhere to more conventional designs. Prefabrication will play an increasingly larger role, and more weather protection than was available in the average pre-war home will be incorporated into these post-war homes.

New Conveniences

YOUR post-war cellar can be made skid-proof with "Dektred," a Goodyear Tire & Rubber Company product which employs semi-precious stones to provide sure footing. It is made by mixing ground garnets with a fireproof synthetic resin binder, and is claimed to be appliable to either wood or cement. "Dektred" can be applied either with trowels or ordinary spray guns, and, according to Goodyear, wears far longer than other types of floor coverings.

"Precipitron" is a trade name for an electronic device which will be available for the post-war home. It removes up to 95 per cent of the dust and dirt in the air, simply by giving dust particles drawn into it a negative electrical charge, and then passing them on to be collected on positively charged metal plates.

A new gasoline-burning heater, about the size of an automobile muffler, will heat an entire bomber, including the de-icing of windshields. A modification of it is expected to be used for house heating after the war.

Many new improvements in the heating field will be brought out after the war. One idea is for a "bungalow furnace." This furnace as tested experimentally contains a coal magazine that will hold fuel enough for three days' burning, and has an automatic feed and control. It is three feet high and two feet square. It is based on the principle of the locomotive firebox, with firebrick lining, air-jet oxygen supply and a "hot spot" for consuming the products of combustion. This latter feature does away with smoke and utilizes every available heat unit in the fuel. The ash residue is a third less than in the old-fashioned parlor stove, and the stove will operate efficiently on any grade of soft coal.

As a post-war product, it is expected that heat-retarding glass will be available in an improved form and at a much lower price than was possible before the war.

"Naugahyde," a fireproof plastic upholstery developed by the United States Rubber Company, is not only flameproof, but is also impervious to water and alcohol, and highly resistant to acids, alkalies, oil, gasoline and greases.

Kitchen Equipment

The modern post-war kitchen will have many conveniences which are non-existent in the average kitchen of today. The more striking of these improvements are the electric dishwasher, which washes, rinses and dries glasses, dishes, silver, pots and pans, all within ten minutes;

Glass blocks in doorway bring in daylight and are attractive from outside at night.

—Courtesy Pittsburgh Plate Glass Co.

Modernistic glass furniture is durable and attractive.

—Courtesy Pittsburgh Plate Glass Co.

—Courtesy Hendrick-Blessing Studio

Recessed heating units save space, are easy to clean, and present a pleasing appearance.

better refrigerators; automatic ranges; and a host of other appliances. Automatic clothes-washers and electric ironers will ease the job in that portion of the post-war home.

One refrigerator company has announced a post-war refrigerator with a built-in freezer, which will hold two bushels of food, and which will be maintained at a temperature of 22° to 32° below freezing. This same concern is advertising a refrigerator which needs no defrosting.

Home Television

Larry E. Gubb, Chairman of the Board, Philco Corporation, says, "The television picture that you can see now is superior in quality to a 16 mm. home movie. Developments growing out of the vast electronic research of the war period will result in even further improvements. With television you will be able to sit at home and not only see the finest entertainment pass in a good-sized picture frame before your eyes, but also be present in person at the great events of the world as they occur."

Flourescent lighting has been much improved during the war and a more extensive use of this type of lighting is expected in post-war houses.

The trend in heating will be as much as possible towards extreme compactness, higher efficiency, and low maintenance cost. Along these lines falls the new type of radiator which is concealed behind decorative grillwork in the wall, thus doing away with unsightly radiators. One of the most promising types of heating seems to be radiant heating. This type of heating is entirely concealed and, according to Charles A. Hawk, of the A. M. Byers Company, Pittsburgh, "makes possible substantial fuel savings and provides greater comfort than any other heating system yet devised." Hawk also stated that radiant heating has already been proven successful in 600 installations of all types before the war. The outstanding thing about radiant heating is that the pipes which make up the heat-transmission system are concealed in either the floor, wall or ceiling, and thus can not be seen, nor can they collect dust. According to an article on radiant heating by Norman J. Radder, Secretary, Plumbing and Heating Industries Bureau, the cost of a radiant heating system with hot water circulated through pipes laid in the floor varies from 6.8 per cent to 9.6 per cent of the total cost of the house, on the basis of typical installations in houses ranging from $5,200 to $8,000. Pre-fabrication is expected to lower these prices.

Automatic stokers and automatic ash-removers will also be more fully developed in the post-war heating field. Lower-capacity oil burners than were available before the war are said to be on the way.

Modulation is getting attention as a promising post-war development. This is the gradual replenishment of heat as it is used up, resulting in even temperatures.

New electric lamps made with krypton gas are said to give more light with less current and to have a longer life.

A newly-developed power lawn mower is said to follow all of the conformations of the ground, leaving no uncut places, and to be salable at about half the price of similar machines.

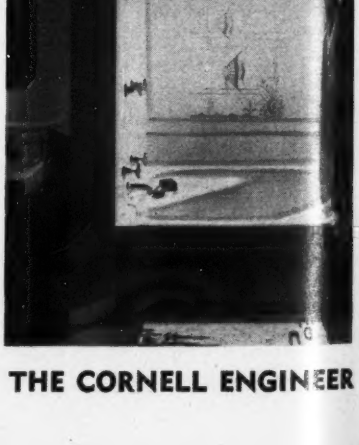
Post-war plumbing, according to Norman J. Radder, Secretary, Plumbing and Heating Industries Bureau, will change both qualitatively and quantitatively from its pre-war predecessor. In his article, "A Preview of Postwar Plumbing," he states that bathrooms will be better planned, more completely equipped, more colorful, and more beautiful than ever before. He expects the trend toward "A bathroom for every bedroom" to continue after the war.

"Foamglas"

A new insulating material that is not affected by water, is non-combustible and a fire retardant, is "Foamglas," manufactured by the Pittsburgh Corning Corporation, affiliate of the Pittsburgh Plate Glass Company. "Foamglas" is a buoyant, cellular glass which fits into the post-war picture by providing a highly effective insulating material for refrigerator walls, for roofs and walls of houses, and around steam and water pipes.

Square tubs insure ample bathing room, yet conserve space.

—Courtesy Plumbing and Heating Industries Bureau



A Note on Post War Architecture

By FREDERICK L. ACKERMAN, Arch. '01

Functionally designed post-war apartment house. Note use of glass walls near windows.

MANY are approaching their second Post-War period. Some look forward in a mood of high hope and exhilaration—some with apprehension, if not fear. Most—whether this be their first or second experience—sense the present as a time of far-flung uncertainties. We cannot, try as we will, block in the large masses of the global picture so that we sense our own individual or national relation to it.

But one thing seems fairly clear: we are not consciously engaged in a Revolution, whatever may be the case with other nationals. The net of our many attitudes is the aim to return to what we were doing when we were drawn into this Global War.

If that be a fair statement of the case, then it would be possible to discuss Post-War Architecture of the immediate future by projecting the drift in architectural expression through the fantastic decade of the 1920's and the years of the Great Depression which followed as an aftermath.

Nothing Revoluntionary

We have already prepared some plans of Post-War, Municipal and State Projects of various kinds. They reflect nothing that is in any true sense revolutionary, nothing which indicates a deflection of the drift that had already gotten under way within the frame of the status quo.

The architecture of conspicuous waste and competitive spending which came to a crest in the late 1920's gave rise to a reaction within the architectural profession in favor of a simpler, a more rational, functional expression. Some fantastic, revolutionary things were designed, and a few such projects were built with load-bearing members so deftly concealed as to baffle the observer: they suggested that a moratorium had been put into effect against the force of gravity. Already the strange creations which were designed to by-pass the general trend seem groesque. In total, however, a very real advance in design was made during that period which may well be accepted as a point of departure in the Post-War years.

Functional Design

These simpler architectural expressions, conceived around a grand recognition in plan and in mass of the function to be served by a project, included about every use category of architecture. Subject to some qualifications, these simpler expressions reached a crest in the general field of industrial plants and the architecture of airports: this is in line with what might be expected; programs of functional requirement could be simply stated; crea-

(Continued on page 31)

THE AUTHOR

Mr. Frederick L. Ackerman received his Bachelor of Architecture degree in 1901 from Cornell University. While here, he was a member of Sigma Xi and Quill and Dagger. He is also a Fellow of the American Institute of Architects.

Mr. Ackerman did much architectural work for the University, having designed Balch Hall, the War Memorial and other buildings. Since 1943, he has been working in connection with the Lillian Wald housing project, operating under the post-war program of the New York Housing Authority.

Mr. Ackerman

Cornell's New Engineering College Campus

SITUATED at the south end of the campus, it will occupy some twenty-two acres. The planned group of buildings of the College of Engineering will provide the very latest in laboratory and classroom facilities, functionally integrated for most effective instruction.

OLIN HALL of CHEMICAL ENGINEERING

OLIN HALL, the gift of Mr. Franklin W. Olin, C.E. '86, is the first unit of the proposed new engineering buildings. Completed just before building materials were frozen, it houses the School of Chemical Engineering. It has been especially designed to provide thoroughly modern facilities for the instruction of undergraduate and graduate students in this branch of engineering.

Unique features include a number of unit laboratories for the exclusive use of individual graduate students or small groups of advanced undergraduates, a three story Unit Operations Laboratory where large scale pilot plants are constructed for study of the actual operation of full-size commercial plants and classrooms, lecture rooms and library embodying the latest features in their design and equipment.

S. C. HOLLISTER, Dean
College of Engineering
Cornell University

ARCHITECTURE

(*Continued from page 29*)

tive design was not confused with irrelevant aims.

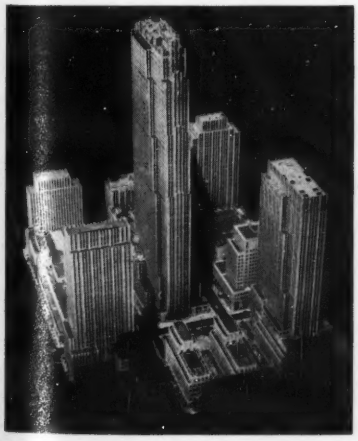
Any discussion of Post-War Architecture which failed to deal with prefabricated houses would be incomplete. Indeed, judging from the amount of general publicity it has received, some might expect little else in a discussion of Post-War Architecture.

Viewed from the architectural side lines, the prefabricated house appears as primarily a highly technical problem in production and a headache from the standpoint of financial servicing—there are too many operational and financial gaps between the beginning and the end of the prefabrication assembly line referred to in all the publicity. There is, after all, little about the process which approximates the assembly line, as we now use the term: we would not be shouting very much about our automobile assembly line had the millions of cars produced been assembled in individual garages. We have still to turn the corner of this sector of the industrial and financial front.

I doubt if there are many basically new materials just around the corner; and I doubt if, in the near future, there will appear more than a few which will possess such physical characteristics as would induce revolutionary changes of architectural forms. It is not probable that the force of gravity, nor pressure of the wind, nor the laws of thermodynamics will undergo any sweeping modifications upon the establishment of the terms of Peace: stress diagrams will continue to have much the same general shape. The use of new steel alloys, new concretes, new combinations of plastics and plywood—and what not, would not likely result in forms which differed other than in respect to detail and in magnitude. And should some new material, yet to be discovered, possess what would strike us as fantastic physical characteristics, there would be a very considerable time lag before the technicians could adjust their thinking and laboriously construct mathematical tables to facilitate its use.

Rockefeller Center—pre-war example of functional design—sets pattern for post-war cities.

—Courtesy Thomas Aircraft



—Courtesy Pencil Points

This modern dwelling illustrates the trend toward light, space, and harmony with natural surroundings.

But if the most improbable were to happen, we would still have thousands of antique codes, graven on tables of stone, as it were, which the vested interest of real estate organizations, producers, material dealers and labor would defend to the last ditch against any change whatsoever. I do not see how we can soar very high into a bright, new, post-war future with such a bundle of weights hanging around our creative necks.

Air conditioning is not only here; it looms large over the horizon beyond the edge of the war.

During the early years of air conditioning, owners often operated their systems with far too wide a differential as between outside and inside temperature. However, they are learning to maintain a sensible differential; and installations are now so operated as to eliminate noise and noticeable air currents. The early "black eye" period has passed.

The above suggests in brief outline the probable trend in architectural expression during the first years of the Post-War period. To attempt longer prediction would be hazardous—we have so very little to go on; the character of our architecture is too closely linked to the fate of our urban centers which is blacked out by the social and economic cross-currents of our time.

Though young in years, our urban centers are well advanced on the road toward physical decay; and they are much farther along the road toward complete absolescnce than we realize. What we do about this important fact will determine the architectural expression of our future. Such a statement provokes the question why these, the most modern of cities, should become obsolete in the days of their youth —why obsolescence is now running at an accelerating rate. Here is a clue.

Street Planning

The early gridiron pattern of streets, which has served through the years as the pattern of urban expansion, was conceived under guidance of a simply stated aim: the objective was to discover that arrangement of streets, blocks and lots which would yield the maximum number of front feet per acre

(*Continued on page 56*)

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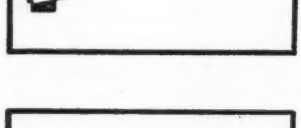

2. POSITIVE ROLLER ALIGNMENT: During the development of the Timken Bearing, as speed, load and accuracy requirements increased, various methods were used to stabilize the rollers and prevent them skewing in the raceways. The solution was found in establishing wide-area contact between the large ends of the rollers and the undercut rib of the cone, thus assuring constant and accurate roller alignment around the periphery of the raceways. The light areas on the ends of the rollers in Figure 2, show contact of rollers with undercut rib of cone.

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TAPERED ROLLER BEARINGS

New Materials and Construction Methods

By BERNARD A. SAVAGE, M.E. '25

President of The Cornell Society of Engineers

AT no time in the history of man have prophecies reached such dizzy heights of high promise of the miraculous new things to come to the building industry as the present journalistic clairvoyance, and otherwise confusing propaganda, would lead us to believe.

The pitch of this propaganda has added considerable glamour, not usually associated with the ordinary methods of development and research. Contrasted with the centuries-old evolution of building construction, these prophecies resulting from imaginative excursions though the streets of Futurama provide for spectacular changes in our past concept of tools available to the construction industry. In glowing headlines, the proposed changes promise new developments leading to more comfort and less drudgery for the immediate postwar era, and leave the reader with an intriguing and indelible picture of a newly conceived dream house.

That is the promise; what can we expect in performance? In the war fever of invention, great strides must have been made in the field of materials and construction practices. The old familiar materials, the new light-weight metals, chemical plastics, moulded resin-impregnated wood plastics,—to mention only a few—will become available only after the war has been won. These new developments in materials and construction techniques, prior to their general use, will have to be adapted, tested, and proved with respect to the practical considerations of function, appearance, integrity, performance, maintenance, and public acceptance. Even the most promising may develop some "kinks" which only exhaustive observation, research, and testing will disclose and correct.

It is entirely too much to hope that the war time fever of invention will produce new developments in products fully conditioned for a long range peace time use.

Now, just what can be expected in new things for the building industry?

Let's investigate the progress, which follows an orderly course of gradual evolution of materials dedicated to the service of mankind. In post-war construction, will plumbing and floor materials be plastic, windows unbreakable; will partitions be movable; will we have glass walls, sliding panels, aluminum radiators, one-piece kitchens, year-round air-conditioning, packaged bathrooms, solar or radio controlled heating, self-sealing closets, screenless screen, and robot laundries? These are signs of a new day, but these exciting trimmings of technology may be some time in reaching the public, and certainly will not come fast enough to revolutionize, in a hurry, our way of life.

Commercial and, particularly, residential air-conditioning have been so improved, that rapid installation of all-year air-conditioning plants would now be a reality were it not for WPB restrictions. These combination units are equipped with air filters, in some cases electronically operated, so as to free the air from all dust, and are cleansed of odors by using activated carbon as an absorbend—thus delivering conditioned clean air throughout the building with controls set as desired for comfort.

Developments in heating have not been too plentiful, except in the reduction in size of units to save space, and in the new interest being focused on radiant heating. Radiant heating can be of the steam or hot water type, with piping em-

(*Continued on page* 41)

THE AUTHOR

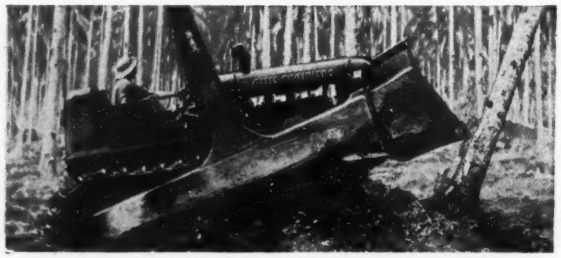
Mr. Bernard A. Savage graduated from the School of Mechanical Engineering in 1925. He was a member of Sphinx Head and Atmos and was elected Life Secretary of his class. Since his graduation, Mr. Savage has been very active in his class reunions, and after holding several offices in the Cornell Society of Engineers, was recently elected President of the Society.

Soon after graduating from Cornell, Mr. Savage joined the New York City Board of Standards and Appeals as a structural engineer. He is now serving his third six-year term as Commissioner of the Board.

Mr. Savage

Three "Not-so-Sec t"

THAT HELPED SURPRIS HE



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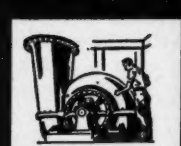
STEAM AND HYDRAULIC TURBINES

MOTORS & TEXROPE V-BELT DRIVES



BLOWERS AND COMPRESSORS

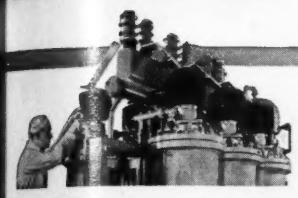
ENGINES AND CONDENSERS

CENTRIFUGAL PUMPS

FLOUR AND SAW MILL EQUIPMENT

...ct" Weapons

...RIS HE JAPS!



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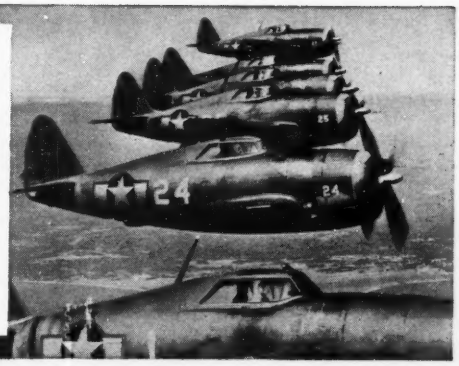

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VICTORY NEWS

Gas Turbines Take Up To 50% Less Space: Plans for a 5000 HP locomotive powered by 2 complete gas turbines have already been drawn up by Allis-Chalmers. Because of simple, compact construction, these turbines require just *half the space* needed by conventional engines—deliver their power with unusual economy.

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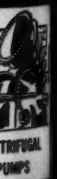

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FOOD AND FARMING

Edited By MARGUERITE E. HAVEN, ME '45

Falling Apples

DON'T sit under the apple tree; you might be hit on the head by a falling apple. If you must sit under a fruit tree, safeguard your skull with "Parmone."

Several chemical manufacturers have sprays that retard the falling of apples and pears from trees. Fruits fall because of a chemical change that results in the breakdown of a layer of cells in the stems. A chemical action occurs when fruit is sprayed with "Parmone", the Du Pont spray, which retards this breakdown. Only four grams of this chemical are needed to make 100 gallons of spray. Apples treated with this spray are claimed to be heavier, have better color, taste better and keep longer.

Millions of dollars are lost each year to fruit growers when fruit falls to the ground prematurely. If the fall of fruit is retarded, growers will be able to use their labor more effectively. More and better fruit will be available to the nation.

Dairy Equipment

ORDINARILY it would never occur to anyone that dairy equipment could be on the list of post war improvements. Ice cream is dished out to the populace, and that is about the only direct contact the public has with dairy equipment.

During the war, dairy equipment has been undergoing extreme wear and tear due to long hours of operation, handling products of lower fat content, and operation by less experienced and competent help. This would indicate a replacement of equipment of at least 50% greater than normal.

Mr. A. W. Farrall, of the Creamery Package Mfg. Co., believes that there will be a considerably increased demand for dairy equipment; because production of dairy products will be greater in order to take care of the natural increased demand resulting from the fact that during the war much of our population has learned the the advantages of liberal use of dairy products.

To improve the taste and healthfulness of products produced in dairy machinery, automatic control for pasteurizing milk and washing equipment will be incorporated wherever possible. For example, the flow diversion valve, used on high temperature short time pasteurizers, has been developed for automatic control. Sanitary type construction will be adopted everywhere and will replace old equipment. This construction enables every piece of apparatus which comes in contact with the product to be thoroughly and completely cleaned. New types of stainless metals will be used. Improved appearance and simplification of construction will be the final touches.

Modern methods of food preparation would be to no avail without the farmer.

Dehydrated Foods

MANY people joke about dehydrated foods or else feel sorry for our members of the armed forces who are eating food in this form. However, there are some persons who have done more than joke.

Several faculty members of the Home Economics College here at Cornell have spent many hours conducting tests on the preparation for dehydration, storage, and cooking of many kinds of food. They have discovered that many cooked dehydrated vegetables have more "to put your teeth into," that is, have more "body" than do some vegetables cooked fresh, frozen, or canned. Canned vegetables do not look or taste like fresh ones; and one must learn that dehydrated foods should be accepted or rejected on their own merits and not because they are like or unlike fresh ones. Dehydrated vegetables may be cooked the same way as fresh, frozen, or canned, and nearly as great a variety of dishes can be made from them.

Tests have shown that dehydrated vegetables (if prepared properly) keep their natural color, odor, flavor, and texture. These tests revealed changes that occurred with different storage methods and different times of refreshing. For instance, beets and cabbage can be stored at from —40°C to around 14° in air, CO_2, or packaged, although the cabbage gives best results at —40. Refreshing-time

Housewives of the future will not have to worry about dropping milk bottles or rinsing them out after usage. Milk "bottles" of transparent Koroseal can be discarded when the milk is gone. Dairies will no longer have problems or sterilization, and late sleepers will not be awakened by rattling milk bottles.

—Courtesy B. F. Goodrich Co.

tests on beets showed that 2½ hours is about the longest time to use for satisfactory results, and this at temperatures from 20 to 98°C.

Perhaps dehydrated foods will someday be part of our daily lives just as fresh, frozen, and canned foods are today.

Mechanical Combine

One machine that is not just a pipe-dream is the self-propelled combine. The International Harvester Company has already begun limited production of this harvester-thresher.

The self-propelled combine is operated by one man and one engine. It eliminates the use of a tractor and extra man, needed elsewhere during the harvest season. The machine cuts grain, picks it up, and threshes it. The concave grate is adjustable for combining different sizes of seeds. Unthreshed heads fall into the trailing trough, and weeds, straw, and coarse material are carried out through the rear of the machine.

The combine is run by a six-cylinder, heavy-duty engine with self-starter, which operates the cutting, feeding, and threshing mechanisms and also propells the harvester-thresher. The transmission provides four speeds forward and one reverse; these ground travel speeds are independent of the threshing speed. Travel of the machine is operated by the clutch pedal, but the separator is not stopped by this action. A hydraulic pull type cylinder and life pump controls the level of the platform.

The weight of the machine gives it traction in a wet field where it would be difficult for a tractor drawn combine to operate. There is no difficulty in handling on highways, and the vehicle has a road speed of eight miles per hour.

The self-propelled Combine with pick-up attachment provides an improved method of windrow harvesting. The machine can start combining wherever the grain is ripe. It goes around coulees, gullies, etc., without back swath to save grain and seed. The labor-saving machine has already gone into limited production.

—Courtesy International Harvester Co.

Cotton Picker

—Courtesy International Harvester Co.

A cotton foreman's daughter tries out the ease of handling a mechanical cotton picker.

Finally developing a cottonpicker which will safely and cleanly harvest a large percentage of ripe cotton without destroying immature bolls, International Harvester Company has put into production the McCormick-Deering Cotton Picker. Operated by one man, the picker is provided with two vertical drums on which are many fingers. As the machine is moved forward, cotton plants are caught between the revolving drums; and the fingers enter the ripe bolls, catching the lint. The lint is removed from the fingers by rubber doffers and blown through a cleaner into a basket which holds about one-half of a bale of seed cotton.

Cotton picked by the McCormick-Deering cotton picker will average one-half to one grade below hand piceed cotton. The machine will pick 95% of the pickable cotton on the plants. In an hour and a half 1500 pounds of seed cotton, which processes into a 500-pound bale of lint, can be picked. This is the equivalent work of 40 to 50 hands on a plantation. Including the original cost of $3900, a cost account of the machine picking one bale is about $5.00, while manually the cost is over $30.00. Therefore the loss in value due to the lowered grade is amply offset by the lowered labor cost. In addition, the tractor itself can be used outside of harvest season for cultivating, planting, and other farm chores.

The Future of Frozen Foods

By DR. DONALD K. TRESSLER, Ph.D. '18

Manager of the General Electric Consumers Institute

DURING the past few years, million of persons who had never before eaten frozen foods have had the opportunity to become familiar with them. Their fine flavor, texture, and brilliant color—comparing so favorably with fresh cooked foods—have captured the preference of these millions who anticipate using frozen foods regularly in the postwar era.

As a result nearly every one of the important grocery store corporations and cooperatives, as well as the larger department stores having grocery departments, are planning to distribute frozen foods on a large scale just as soon as ample supplies are available. In addition, there are many companies considering the house-to-house distribution of frozen foods. Many companies formerly engaged either solely in the canning or dehydration of foods are planning to preserve considerable quantities of foods by freezing just as soon as suitable refrigeration equipment is available. A considerable portion of the postwar household refrigerators will have frozen food compartments which will be maintained at zero degrees Fahrenheit, and thus the housewife will be able to buy frozen foods in quantity and hold them for a week or two, or even a month, without noticeable deterioration in quality.

Future Distribution

With increased production of commercial frozen foods and adequate home storage facilities available to the consumer, distribution will reach every corner grocery and country store throughout the country within a few years.

All this points to an even more rapid increase in the production and sale of frozen foods than has occurred during the past decade.

Fish was the first food to be frozen commercially on a large scale. Poultry and meats began to be frozen in considerable quantities early in the first decade of the twentieth century. Frozen fruits were introduced to the ice cream and bakery trade about 1910 and soon became very popular in the wholesale trade. Frozen shrimp, scallops, and certain shell fish were introduced about this time. The freezing of cream has also been of importance for many years. One of the most recent developments of the frozen food industry is the freezing of vegetables. However, the acceptance of frozen vegetables has already passed the one-hundred-million-pounds-per-year mark and is still growing by leaps and bounds.

Not only has the sale of frozen foods at retail increased greatly; but there has also been a much greater demand for these foods on the part of the hotel, restaurant, the institution trade, the baker, the ice cream maker, and the Armed Forces. The industry gives promise of becoming the most important of the food preservation industries.

Early Frozen Foods

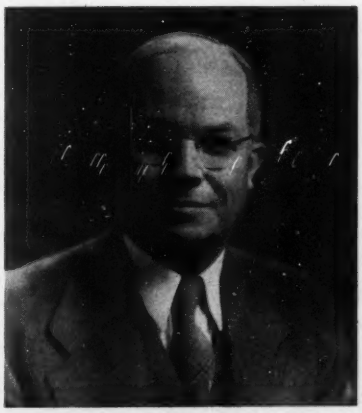
Prior to 1930 frozen foods were not sold at retail as such. Fish dealers and others selling frozen foods thawed them prior to sale. This resulted in an inferior product because of carelessness in thawing and the fact that the foods were allowed to stand for considerable

THE AUTHOR

Dr. Donald K. Tressler attended college at the University of Michigan and Cornell University. He received a degree of Doctor of Philosophy in Chemistry at Cornell in 1918.

Since then he has studied different food processing methods in many universities, business concerns, and a government bureau.

From 1933 to 1943 he was head of the Chemistry Division of the New York State Agricultural Experiment Station in Geneva, N. Y. and Professor of Agricultural and Food Chemistry in Cornell University. He is now manager of the General Electric Consumers Institute.



Doctor Tressler

periods of time in the thawed condition.

In 1929, Mr. Clarence Birdseye had a new conception of the marketing of frozen foods. He believed that if foods were carefully selected, prepared, packaged, frozen, stored, and transported, the product was fully the equivalent of the better grades of fresh foods. He coined the term "frosted foods" and emphasized the superior quality of *quick* frozen foods. When the importance of quick freezing and low storage temperature became generally recognized, frozen foods became popular. Already many retailers are offering nearly complete lines of frozen foods: vegetables, fish, shellfish, poultry, and meats. Mr. Birdseye's theory has proved to be correct, for today commercially frozen foods are of very high quality, certainly the equivalent of the better grades of fresh foods.

Typical Frozen Foods

Some ready-prepared cooked foods (cooked squash and corn-on-the-cob) were also offered in the early 30's. But more recently there has been much interest in the freezing of cooked foods of many types. Frozen baked beans, chop suey, creamed chicken, chicken ala king, chili-con-carne and some other products are now being packed by one or more commercial companies.

It seems entirely possible that the freezing of ready-prepared foods will continue to expand and that eventually the housewife will be able to buy a complete meal frozen in convenient packages ready for rapid thawing in the oven and immediate use. The "postwar dreamer" even believes that this offers great possibility for the high-class restaurants and hotels which employ chefs of international repute. However, it must be remembered that the freezing of foods has not been perfected to the point where there is no loss of flavor, aroma, texture, etc. Further, unless temperatures of 20 degrees below zero or lower are maintained most frozen foods slowly lose quality during storage. For this reason unless much care is taken in the preparation, packaging, storage, and thawing, the cooked foods may taste like warmed over left-overs rather than freshly cooked foods.

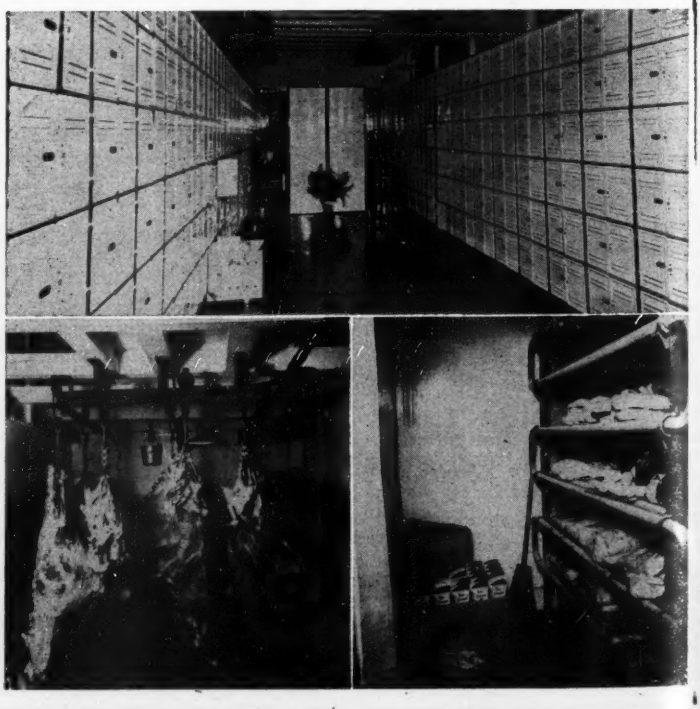
In 1930 and 1931, two of the larger dairy companies tried the freezing of retail packages of orange juice on a large scale. The venture was not successful largely due to the difficulty of thawing the orange juice quickly and still having it of a quality fully the equivalent of the freshly prepared juice. The housewife soon found that it was about as easy to squeeze fresh juice from oranges as it was to thaw the frozen juice. From time to time interest in frozen juices is revived, and although large quantities of orange and other juices are frozen for commercial uses, no one has, as yet, solved the thawing problem. Perhaps someone will invent a high frequency dielectric heating device which will rapidly thaw a cake of juice in a matter of a minute or two. When a simple inexpensive thawing device is available, it is likely that frozen juices will quickly become of major importance in the field of commercially preserved juices.

The commercial frozen food industry has already taken on international importance. Frozen meat is being shipped from Argentina and Australia to England. Some frozen pineapple is being packed in the West Indies and shipped into the United States. On the other hand frozen peas, spinach, and certain other frozen vegetables are being transported from the northern states to tropical and semi-tropical areas. Looking to the future, it is probable that many tropical fruits, such as the mango, will be frozen in great quantities in South America and other tropical regions where they grow in great profusion and then shipped to the temperate regions. If this comes to pass, we will all become familiar with the mango and many other tropical fruits, now scarcely, if ever, seen in the United States. With this development will come the extension of the frozen food industry to all parts of the world.

Home Freezers

We are all looking forward to the time when home freezing and storage cabinets and household refrig-

Three phases of the frozen food and locker plant industry. The upper picture shows the interior of a modern frozen food locker plant. Each customer has his own compartment with key to store both foods prepared by the plant and foods he may have purchased elsewhere. In the lower left-hand picture meat is awaiting preparation for cutting and freezing. In the picture at the right many varieties of food are seen in the low-temperature freezing chamber of a plant. *—Courtesy Kansas State College of Agriculture and Applied Science*



—Courtesy Motor Products Corporation, Deepfreeze Division

A compact home freezer of pleasing appearance. One side is used to freeze food, and the other side is storage space for the food that has been frozen. The freezing mechanism has been positioned between the freezing and storage compartments.

erators with low temperature compartments will be commonplace in this country. Everyone feels that the general use of freezers will mean better living for all; because, if properly prepared and stored, frozen foods are the equivalent, nutritionally speaking, of fresh foods when cooked and so can contribute in great measure to better health. In the tropics, refrigeration facilities are not as common as they are here in America, and in those countries it is even more difficult to preserve foods from day to day and from week to week. Consequently, the people of the tropics will profit even more by the introduction of frozen foods and the general use of home freezers than those of us in the temperate zones.

Although the freezing of foods has emerged from an obscure commercial convenience to a prominent industry during the past half century, it has by no means reached the limit of its expansion. There is little doubt but that, as we learn more about the science of freezing, we will be able to freeze many foods which can not now be satisfactorily preserved in this way. Also as food freezing becomes of importance in other parts of the world, we can visualize frozen foods becoming an instrument for great expansion of international trade in the years to come.

Construction Methods

(*Continued from page* 33)

bedded in the concrete floors and ceilings, thus eliminating unsightly radiators, grilles, and recesses. Forced hot air systems, with ducts embedded in floors, walls, or ceilings, or with a plenum chamber above ceilings or below floors, are other adaptations of this method. Gas and electric unit heating will be more generally used because of the compactness of the units and economies in material and installation costs, resulting from the elimination of the boiler, the boiler-room and chimney, steam or hot water piping, and radiators. From the aircraft heater field, it is entirely conceivable that vest pocket heating units now being made for aircraft will be redesigned and adapted to house heating, providing an insulated, hermetically sealed, small, efficient heating unit, which may be placed in an inconspicuous location.

Plastic materials promise much in the decorative fields, as hardware, trim, and accessories for electrical applications, while plastic wood, impregnated by resins, may find a high place as a structural material, which may be pressure-moulded into structural shapes similar to steel. Through the development of some unusual resin adhesives mixed with urea resin, wood when treated with this complex resin loses its natural tendency to swell, shrink, or warp with humidity changes, becomes harder, stronger, and more durable, and does not shed or splinter during sawing, planing or turning. The wood is actually transmuted, and, with the use of suitable dyes, light colored pine or poplar can be made to look like cherry, rosewood, or mahogany.

It is now possible to form wood into any desired shape by forming laminated sections into beams, trusses, arches, and many other new structural shapes. Structural timber, enhanced by the use of timber connector fastenings and developments in the technique of glued laminated wood members, will be extended to many new and interesting applications. Wood veneers attached to steel sheets by means of a metallic adhesive have been developed to function satisfactorily, and will be available for decoration.

Light-gauge metals, whose physical properties have been recently investigated at Cornell University, have much to promise in the construction of light buildings having channel and cellular types of wall, floor and roof construction, particularly since the use of X-ray controls during the rolling process will permit structural and dimensional uniformity. With the use of these lightweight metals, there will be interior and exterior partitions filled with improved thermal, fire, moisture repelling, and acoustical insulating materials considerably thinner and stronger than the conventional partitions. Tubular columns are destined for greater usage than the conventional-shaped columns because of their better resistance to torsional stresses.

One of the most interesting developments in the light-gauge metal field is the development of a steel cellular plank-like floor system, supported on a skeleton frame, which provides accessible electric wire raceways, thus making it possible to obtain electrical connections in any desired portion of a space. This construction reduces the total weight of a building, carries all construction loads, and, with a ⅞ inch gypsum plaster ceiling over metal lath, using vermiculite as an aggregate in place of sand, passed a four hour fire test at the Underwriters' Laboratory.

The subject of enclosure walls, in keeping with progress, deserves serious study and might well be subjected to an overhauling as to fire resistance ratings, in view of the

Pipes for radiant heating are imbedded in ceilings, floors, and walls.

A large curved window such as this would be impractical due to heat loss in winter if not glazed with Libbey-Owens-Ford's new multiple paned Thermopane windows.

apparently unlimited use of glass in metal frames, or glass block permissively allowed as a substitute therefor. Glass, of itself, has been developed so that it may now be cut, drilled, and nailed, almost like wood. Tempered glass has found a structural application in ornamental entrance doors with or without rails and stiles. Windows thermally insulated by two panes of glass, between which there is a dehydrated air space hermetically sealed by a metal to glass bond around the edges, promise a substantial reduction in heating costs, prevent frosting of the windows by reducing condensation, and add to fire and sound resistance.

One product that appears promising is an attractively veneered board with incombustible bonded glass wool core, and with the fibers so oriented as to resist working strains. This has already passed the experimental stage, and is suitable for use in insulated wall finishes, partition panels, fire resistant furniture, and steel faced roofing and siding units.

The manufacture of pre-cast artificial stone, joists, planks, and blocks has been improved by modernization of equipment, controlled batching, accurate water control, thorough mixing, and adequate curing. A promising development in this field is in the increase in the rate of hardening of precast concrete units. In this process, units are cast in hollow forms, which are then heated by hot air or electricity to a high temperature, simulating pressure cooking. The use of this method permits units to be handled in 3 to 4 hours without any further curing or aging since strengths equivalent to 28 days are attained in the space of a few days.

In concrete design the trend engineers are following is to use analyses based on elastic theory, instead of empirical moment coefficients. These analyses permit not only greater economy but provide a better distribution of steel and concrete materials in better conformity with the elastic behavior of the structure under loading or other conditions of stability. Present indications are in the direction of a wider use of flat ceiling design, such as flat slabs without capitals or dropheads and other smooth ceiling systems, wherein the architect has complete freedom of interior design. Pre-stressed steel in concrete intended to minimize surface cracking by inducing initial compressive stresses in concrete will find greater use particularly in the manufacture of tanks, planks and other special concrete constructions.

The effect on construction resulting from war black-out and possibility of bombing is certainly beyond the economics of normal peacetime construction. However, we have learned that large air-conditioned and artificially illuminated factories have been built without windows, using exterior walls of thin insulated materials, sufficiently strong in themselves so as not to require any structural framing to carry them.

Prefabrication has been so glamorized by the housing needs of our war industries that considerable attention was focused on this field by the Unied States Government, which became a large mass buyer interested only in large numbers of units which could be quickly obtained. The assemblies for these

(*Continued on page* 60)

Testing Mica Sheets

Mica's special insulating qualities are mighty important in communications equipment. No equivalent exists, so war's huge demands caused a critical shortage.

Bell Telephone Laboratories' scientists were assigned the task of somehow finding more mica. They found it—in the very considerable amounts of raw mica which visual inspection had rejected. By developing electrical apparatus to test the two most important electrical properties, they increased the usable amount of mica by half and so stretched current supplies of mica to fill all military needs.

In many such ways the Bell System is serving the nation, constantly meeting the needs of our fighting forces for dependable communications.

BELL TELEPHONE SYSTEM

"Service to the Nation in Peace and War"

Will there be any objection if post-war cars resemble this 1940 Chrysler "Thunderbolt"?

EXPRESSWAYS

(*Continued from page* 13)

the expressway drives and the service roads or between the expressway and the property lines, should be on easy gradients so as to prevent erosion.

Alinement and Horizontal Curvature

It is reasonable to state that roads cannot be designed so as to be safe for the general public to travel at speeds in excess of 65 miles per hour. In an article entitled, "Tomorrow's Cars and Roads," Robert Moses, Chairman of the New York City Parkway Authority, stated, "Thirty miles an hour on the average boulevard is plenty in cities, forty is enough in the suburbs, and fifty should be tops anywhere in the country, no matter how open and thinly populated. My idea of futility is to build a beautiful parkway for speed demons who can't tell a flowering shrub from a bale of hay."

Many highway engineers still advocate long, unbroken tangential alinement in rolling as well as in more or less level terrain. Roads of this character are monotonous to drive over, dangerous (particularly at night when head light glare may be seen for long distances), usually disregard valuable features of the terrain, and often create large, irreparable scars in sections of excessive cuts and fills. Unless the gradient is more or less level or unbroken, an up and down "roller-coaster" alinement prevails; this is unpleasant to drive over, and danger lurks at one side of every verticle curve. Moderate curvature promotes alertness and relieves the monotony of driving. For these reasons, a curved alinement is advocated.

Transition Curvature

All horizontal circular curves, sharper than two degrees, should be approached by transition curves of a length consistent with the design speed and sufficient to permit the attainment of full superelevation within the length of the transition. Tangents of appropriate length, together with transition curves between all curves in opposite directions, are advocated. Tangents between curves in the same direction should be avoided except in cases where the tangent is so long that the two points of curvature cannot be seen one from the other.

All curves sharper than one degree should be superelevated. The maximum superelevation should be 0.12 per foot; 0.08 per foot of superelevation should not be exceeded where a frequent slippery condition of the road is likely to exist.

The gradient of the roads should be adapted to the surrounding topography, the volume and type of traffic, and the relative necessity for passing trucks and tractor combinations. A maximum gradient of three per cent is desirable for an expressway and, if possible, should not be exceeded.

Bridges and Grade Crossing Elimination Structures

Bridges should be designed to fit the predetermined alinement and gradient of the roadways. While structural and architectural requirements may necessitate certain adjustments, these should not cause the lowering of expressway standards.

The distance between the face of the curb and the bridge abutment, pier, railing, or parapet, should be not less than three feet on the left side of the expressway and five feet on the right side. Where possible, the shoulder should be carried across all bridges when accelerating and decelerating lanes are not provided.

Where access drives between intesecting highway and the expressway occur, as in the vicinity of grade crossing elimination structures, it will probably be necessary to widen the spans and to increase the width of the structures by two full lanes in order to provide for decelerating and accelerating lanes over and under the structures on both the expressway and the intersected highway.

A minimum clearance of 14 feet should obtain for all grade crossing elimination structures.

Access Facilities

Many different types of access facilities are possible of development. In no case should left-hand turns be permitted on the expressway. Access drives connecting the intersecting or border streets and the expressway should be between the outside or the slow moving expressway lanes and the border streets; this design policy is in the best interests of safety. Acceleration and deceleration lanes are recommended on the expressway so that vehicles may slow down or increase speed in a lane independent from the moving traffic lanes.

Landscape Design

All valuable and irreplaceable landscape features should be preserved; needless damage to trees and other growth and to lake and waterway shores should be avoided. Unnecessary construction scars in the form of borrow pits, for example, should also be avoided.

Proper planting of the expressway is desirable for many reasons, one being economy of maintenance. The appropriate planting of slopes will prevent erosion; the intelligent use of shrubs and trees will often retard the formation of snow drifts on the pavement. Appropriate embellishment, through planting the park strips on each side of the pavement, will tend to make the project more valuable for those who use it and more attractive for those who live along the adjacent border lands.

A METAL FOR TODAY AND TOMORROW . . .
MAGNESIUM'S USEFULNESS IS BROAD YET CLEARLY DEFINED

Magnesium is aptly called *the Metal of Motion.* For this abundant basic metal, extracted by Dow from sea water and from Michigan brine, is the lightest of all structural metals, it is durable and strong, and so it finds its place wherever metal is to be put in motion, wherever inertia is to be overcome. In all the varied fields of transportation—on highway, rail, or in the air—magnesium will help move people and materials faster, over greater ranges, more economically. In the moving and reciprocating parts of machines . . . in hand- and power-operated tools, equipment and home appliances . . . in these places is magnesium's inherent usefulness so naturally and peculiarly valuable. It is only logical, therefore, that the weight-saving characteristics of magnesium should inspire new ideas. The Metal of Motion is leading designers directly to fresh concepts of efficiency and speed and comfort for everyday life in our time.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle

• It is our earnest desire to meet all the demands for Allen Wales Adding Machines, but as a result of our effort in the manufacture of vital war materials, we may build only a limited number of adding machines.

If you are in need of Adding Machine Equipment, we suggest that you get in touch with our nearest agency or write to our home office for further information.

ALLEN WALES

ADDING MACHINE CORPORATION

444 Madison Avenue, New York 22, N. Y.
A WHOLLY-OWNED SUBSIDIARY
OF

THE NATIONAL CASH REGISTER CO.

Materials Tomorrow

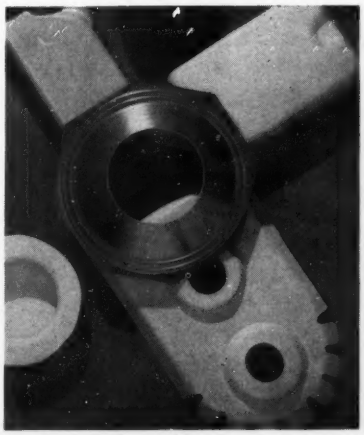
(*Continued from page* 25)

application and poor design of many die-castings have brought these products into general disfavor, and the plastics industry will receive a black-eye every time it thoughtlessly attempts to perform some function to which it is not suited. Fortunately, the men in the industry realize this better than any one else, and it is to be hoped that they will not lose sight of it in the clamor for business when the war is over.

Nylon and rayon will obviously play a prominent role in replacing many of our fabrics in the post-war era. Nylon rope has made possible our glider trains for carrying troops; the same may be used in peace time for transportation of passengers and freight, particularly perishable food stuffs. Wood can be enormously improved by impregnation with a resin which will convert it into a better building material. The properties of lucite are well-known, and its use will be extended after the war. Plastic plywoods and other laminated products will successfully compete with metals for airplane construction and other aplications. Wood treated in this manner is not subject to decay or distortion; its directional properties are eliminated; it can be cheaply finished and formed to the desired shapes; it has a high strength-weight ratio, and is not subject to the corrosion of metals.

The future of fuels, particularly for mobile transportation, has received considerable attention recently. Alarming reports concerning our dwindling oil reserves have come from our Secretary of Interior.

Deep drawing is one of characteristics of laminated phenolic plastic.
—Courtesy Westinghouse



With proven reserves placed at 20 billion barrels, and consumption at 1.3 billion barrels annually, it is apparent that we must soon supplement our petroleum supplies with importations and/or the conversion of solid fuels into petroleum products. It should not be concluded from the figures above that we will be out of petroleum in fourteen years. Even if consumption continues at its present rate, the period will be extended by the discovery of new reserves. Prior to 1937, these new discoveries exceeded or equaled our consumption, but since then, the discovery of new oil pools has diminished sharply. This is, in my opinion, due to two causes: the war has taken away the material and manpower necessary for the exploitation, and the incentive for wildcat drilling has been curtailed through price fixing. When ceilings are removed, and the law of supply and demand governs prices, then the price will rise to a point where it becomes attractive to speculate, and I believe that our oil reserves will be materially increased.

Despite the fact that Germany, Japan, France and England have

(*Continued on page* 49)

O W I Photo by Palmer, in an Allegheny Ludlum Plant

Final Examination

BEFORE STAINLESS GETS ITS WINGS

REDUCE ACCIDENTS!

In 1941, accidents were first cause of death among men from 22 to 38 years of age. The productive man-days lost were enough to build twice as many battleships as now possessed by the combined Allied Navies.

These are losses that *can* be avoided. Don't take unnecessary risks at any time; and later, when you enter business life, remember that carelessness is the single greatest factor in human and economic loss.

A GREAT deal of costly processing is done on stainless steel, to secure the physical characteristics and surface finish required for the particular war job it is to perform. But one day all the rolling, heat treating and surface finishing is completed, and bright sheets of Allegheny Metal lie ready for final inspection and shipment to the war plants.

They're *right,* those sheets—flawless of surface and true to specifications. They'll do their job and more—which is what everything and everybody *must* do, in a war like this. In the case of stainless steel, that job is the supplying of vastly increased strength with equal or decreased weight, and high resistance to heat and corrosion. These are qualities of great value now, and of even greater promise for the future.

AL

STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum

STEEL CORPORATION

BRACKENRIDGE, PENNSYLVANIA

W&D A-9319

Materials Tomorrow

(*Continued from page* 47)

been hydrogenating coal to produce liquid fuels for a number of years, none of these plants can be said to be on a commercial basis—operation is feasible only through government subsidy. To make it commercially profitable, the price on gasoline would have to be two to four times as high as it is now. When prices begin to approach that level, exploration for new deposits will accelerate, importations will increase, and consumpton will decrease, through the development of lighter vehicles powered by more economical engines. Another reason why I cannot agree with Mr. Ickes on the post-war prospects for hydrogenation is because of the fact that this same condition existed at the close of World War I. Practically nothing has been done in this country during the twenty years which have elapsed since I was a student listening to my Heat-Power professor consume several periods on the dire consequences which would soon overtake us when our petroleum reserves would run low. At that time, it seemed that we could make our greatest conrtibution to society by participating in the development of processes for obtaining satisfactory liquid fuels and lubricants from oil shale and coal, which would be necessary long before the present day.

In conclusion, it should be noted that many factors of a non-technical nature may completely change the picture of things. Political developments involving governmental operation, bargain sale of government-owned plants and equipment, and subsidies for the maintenance of production of certain materials and products considered essential for adequate military preparedness would modify enormously the post-war production of some materials and their cost to the consumer. It must be remembered that the selection of a material for any specific use is based on its suitability and cost. If wage scales and prices are dictated artificially instead of by the economic law of supply and demand, then it is impossible to predict the future of any commodity; but, if our system of free private enterprise prevails after wartime restrictions have been lifted, then, our increased productivity and technological advancements should do more to maintain or even increase wages while reducing costs than all the laws conceived by our politicians.

Synthetic rubber tire still bears one-third of its tread after 21,475 miles.
—Courtesy Goodyear Tire and Rubber Co.

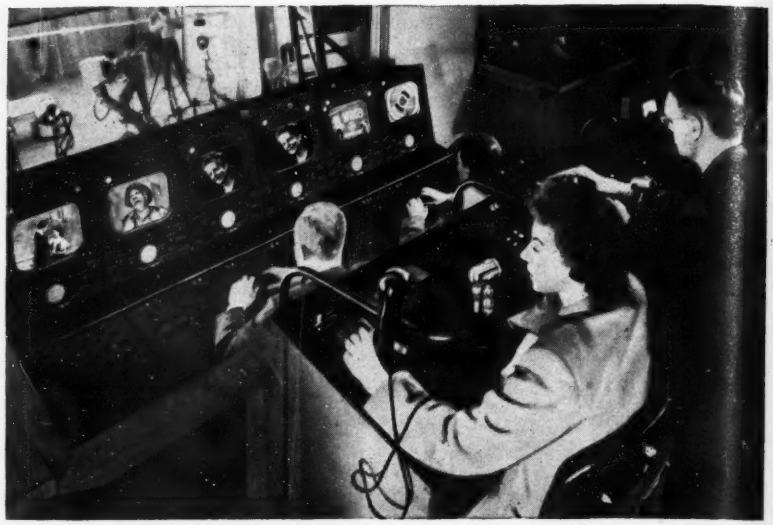
COMMUNICATIONS II

(*Continued from page* 19)

economically sound for other services such as facsimile and sound broadcast programs which are technically feasible by wire lines or coaxial cable. The extent of the development of radio relay links is impossible to forsee this early in their development but they are certain to come into wider and wider use with time and the solving of the detailed problems involved. Obviously, radio relay links must be of the common carrier type and available to the general public, but their widest use for the present at least seems to be in the distribution of television programs for home entertainment purposes.

The greatest direct contributions of the war developments will undoubtedly be in the field of television because of the close relationship between television and radar technically and because most television engineers are now engaged in radar work and will return to their peace time profession enormously richer in technical experience. Few, if any, of the war time developments can be directly applied to television or for that matter to any other communications field and much work remains to be done in adapting the new circuits to peacetime uses. At present, nearly all of this work must be held secret, but the release of secrecy restrictions and the return of large numbers of engineers to their normal jobs will quickly provide the impetus necessary to bring these new developments into public service.

Judged by its effect on American life, it seems clear that television is the greatest development in communications that the future has in store for us. The addition of sight to sound in the field of home entertainment will certainly produce more fundamental changes in living habits and in home life than did the addition of sound to movies. The possibility of watching current events unfold on the screen before you, even though taking place perhaps hundreds of miles away, is bound to produce changes that we can only dimly imagine at present. but this is actually taking place today on a limited scale and is ready for an active postwar development on a major scale.



—Courtesy General Electric

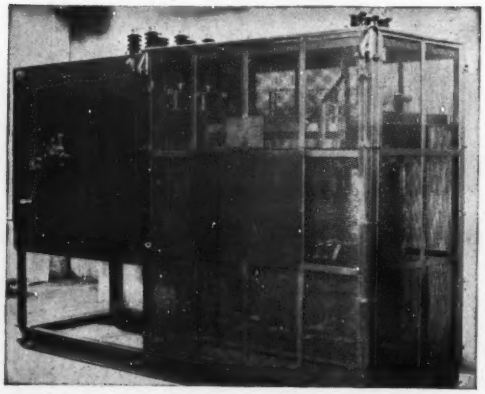
Control and monitoring television in action.

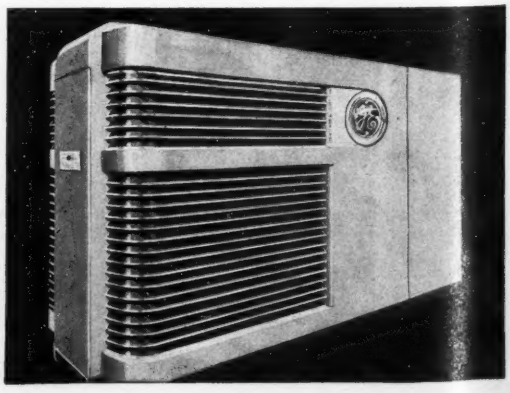
F-M

Even more immediately in the future we have Frequency Modulation broadcasting which brings to sound broadcasting a noise free realism that is difficult to believe. At present some 48 stations are in operation but literally hundreds more are ready to go into service as soon as equipment can be made available and we can already see the time when a major portion of American broadcasting will be on FM.

In the police field, already quite well standardized, war time developments may not be as important as in the television field, but the press of frequency requirements will force the development of a new police band at much higher frequency. This will probably be FM, as are all the modern municipal police systems at present and will be practicable because of tube and circuit developments made during the war.

The end point in communication development will be when anyone can talk freely and confidentially to anyone else anywhere in the world anytime. Obviously, this is many decades in the future if, indeed, we ever reach that goal. Consequently, communication engineers can look forward confidently to a long life of fruitful and expanding developments limited only by natural economic laws.



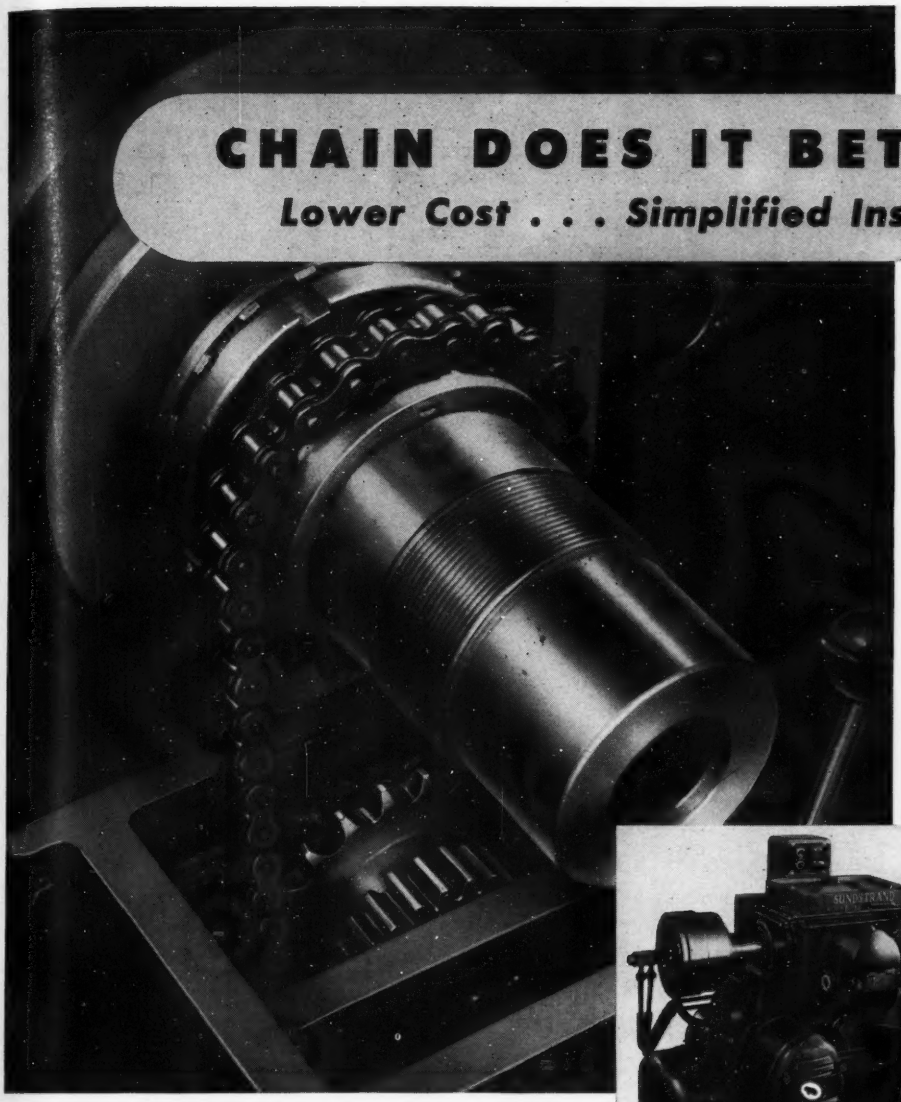


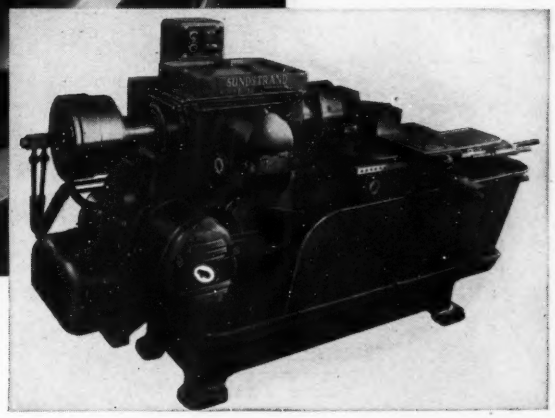
Change in dry type transformer design from pre-war (left) to post-war (right)

—Courtesy General Electric Co.

CHAIN DOES IT BETTER

Lower Cost . . . Simplified Installation





Another example of Morse Roller Chain's smooth efficient transmission of power is the Morse Roller Chain installation on the Sundstrand Model 12 Automatic Lathe pictured above.

Here, Morse No. 50 Single Roller Chain connects the spindle of the machine to the feed box which moves the carriage. As power for the feed drive is taken directly from the spindle, the spindle feeds and the carriage feeds are interlocked.

Here, too, as in hundreds of other installations, the use of Morse Chain permitted simplified installation at lower cost—and the Morse principle of "Teeth not Tension" assured efficient operation.

Whatever your power transmission problems, check with Morse. Morse Engineers will gladly work with you towards obtaining the results you want at the lowest cost—entirely without obligation on your part. Find out now how the principle of "Teeth not Tension" may save money for you.

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *Roller and Silent* CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

TRANSPORTATION

(*Continued from page* 11)

all railroads. Long distance coach travel is expected to furnish the greater part of the business.

Many ways have been discussed to increase passenger comfort. They include more comfortable seats, enlarged and possibly more washrooms, better luggage facilities, and recreational lounge cars. Other planned improvements are smoother riding, less noise, improved heating and air conditioning, distinctive interior decorations, radios in every car, and recreational facilities for children.

Three tier Pullman car arranged for daytime travel.

The sleeper of today will soon give way to the new type "Duplex Roomette". This sleeping car is designed for low cost comfort for the riders and a higher revenue-load capacity for the railroad. This new car (planned by the Pullman Company but still experimental) has twenty-four rooms arranged on each side of a center aisle with entrances arranged on two levels. The upper room is reached by two steps, and the rooms are laid out with the most economical use of space. In each room there is an adjustable seat with sponge rubber cushions, full length bed (which rolls out of the way when not in use), complete toilet facilities, individual control of heat, light and air conditioning, and many other items of luxury.

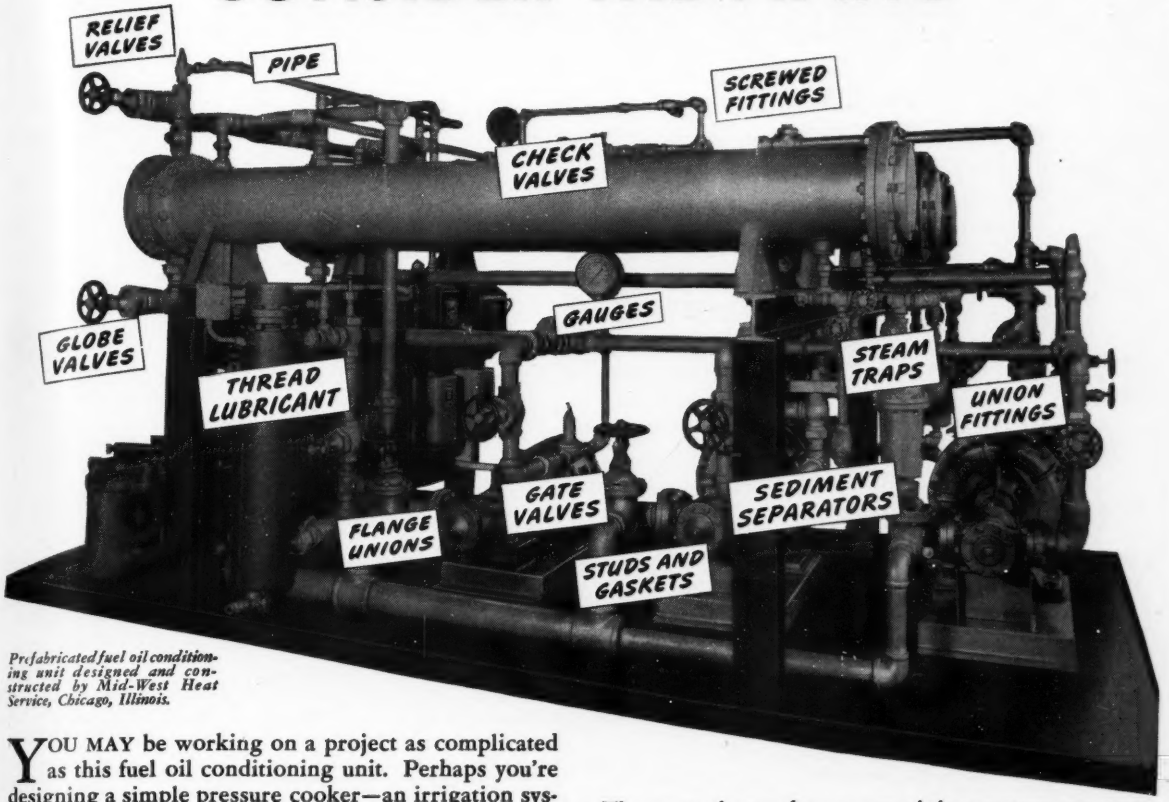
Research has resulted in many technical advances that will improve the general mechanical operation of the railway car. Development of special diesel generator units to handle car lighting, air conditioning, and refrigeration in dining cars will eliminate the need for stopping for ice at frequent intervals and will reduce battery requirements. A new radial drawbar for passenger cars and locomotive tenders will eliminate the lateral component of the longitudinal forces pulling the train, and will produce a smoother ride.

—Courtesy Pullman Standard Co.

"Threedex" Coach for Commuters

With the Diesel engine the whole future of passenger transportation by rail is brightened. Speedier schedules will be possible, time will be saved by the use of the Diesel switcher engine, and more convenient service will be the advantages that the railroads will be able to offer the public.

ON PROJECTS YOU ARE PLANNING CONSIDER THE PIPING



Prefabricated fuel oil conditioning unit designed and constructed by Mid-West Heat Service, Chicago, Illinois.

YOU MAY be working on a project as complicated as this fuel oil conditioning unit. Perhaps you're designing a simple pressure cooker—an irrigation system—a hydro-electric plant—or any one of a thousand other engineering projects. Whatever the problem, they all have this in common: It takes piping to make them work.

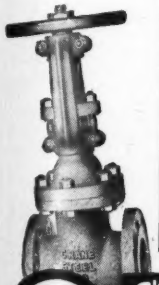
When you make a piping layout, remember that it will have to be translated into solid metal—that the proper kind of valves will have to be installed to meet the service requirements—that fittings and bends—traps and check valves, etc.—must be installed at proper points in the line.

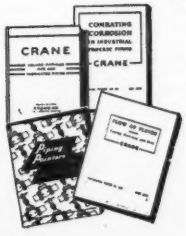
The parts that make up any piping system are many, but it will interest you to know that everything in the complete system is included in the Crane line.

By specifying Crane piping materials, you are assured that a single source will save valuable time all down the line. You are also assured that all parts will fit, providing simpler assembly. Long, satisfactory operation results in the high quality which characterizes piping equipment carrying the name Crane.

CRANE CO., 836 S. Michigan Ave., Chicago, Ill.

HERE'S ENGINEERING DATA TO HELP YOU





Crane engineers have prepared several important books and treatises on piping systems. These include the Crane Catalog, *listing more than 48,000 piping items and containing valuable engineering data*—Piping Pointers Manual, *packed with piping information*—Flow of Fluids *and* Combating Corrosion, *two technical papers of value to any one laying out pipe lines. This material is available from the following persons in your school, for reference.*

Prof. F. O. Ellenwood, Heat Power
Prof. L. T. Wright, Heat Power
Prof. C. O. Mackey, Mechanics Lab.
Prof. C. D. Albert, Machine Design
Prof. Paul H. Black, Machine Design
Prof. W. N. Barnard, Director of School of Mechanical Engineering
Prof. M. Bogema, Hydraulics
Prof. F H. Rhodes, Director of School of Chemical Engineering
Prof. J. R. Moynihan, Engineering Materials

CRANE

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

BRANCHES AND WHOLESALERS IN ALL INDUSTRIAL AREAS

MATERIALS

(*Continued from page 23*)

aluminum seems to have a bright post-war future, embodying the advantages of beauty, lightness and strength.

House Paint

A product probably destined for wider post-war use is DuPont Self Cleaning House Paint. Dirt particles do not become imbedded in this paint as ordinarily occurs, but instead settle on a fine chalky powder which forms on the surface. Rainstorms will wash away both dirt and powder, exposing a clean surface underneath.

Resistance Welder

GREAT wartime advances in welding technique have been made, which have already affected the cost and design of metal structure. The welding of light alloys as well as ferrous metals has been made practical, and substantial improvements in joinings and reductions in production time have been effected.

A recent development in this field is a "universal" resistance welder produced by the Progressive Welder Company. It is capable of spot welding and high speed plane welding of aluminum sections of considerable thickness. It also features an internally cooled seam welder wheel requiring no external water supply. This machine is operated by storage batteries, and needs no transmission line.

New Glass

MANY wartime advances that have been made in the glass industry will be reflected in the post-war period. Laminated safety glass, now being used in tanks and armored cars, will probably be applied to automobiles. Plate glass that can be tempered without losing its optical properties will find a myriad of peacetime uses. Glass blocks, among whose producers are Owens Corning and Pittsburg Corning, will probably be in heavy demand for reconstruction building. Noncombustible, fire retardant glass insulation such as Pittsburgh Corning's "Foamglas" is highly effective for houses, pipes, refrigerators, factories, and in places where there is a high humidity problem.

Wood Surfacing

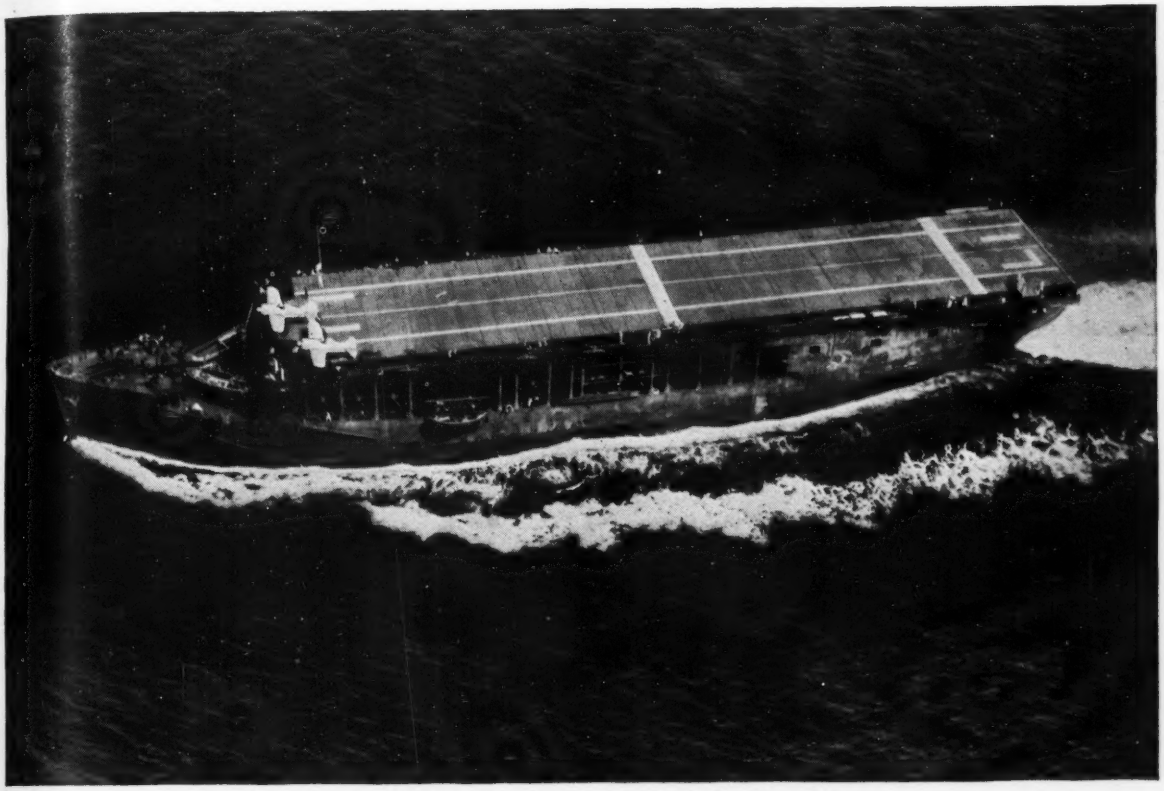
A plastic surfacing paper which can be used to give a glass-smooth finish to wood will be marketed after the war by the Kimberly-Clark Corporation. The plastic paper, "Kimpreg," when applied under heat and pressure becomes an integral part of the wood or plywood. It also contributes such desirable properties as abrasion and moisture resistance, and rigidity to the wood. Among the peactime applications of Kimpreg will be the surfacing of walls and cabinets.

Insecticide

POST war summers should prove to be more comfortable than previously, because of a new insect repellent developed by Du Pont. A successor to citronella, dimethyl phthalate is a clear, nearly odorless liquid derived from the same compound from which synthetic resin enamels

(*Continued on page 60*)

First Baby Flat-Top Hangs Up a Great War Record



P. S. She is propelled by Busch-Sulzer Diesels

The Navy Department recently revealed that America's first escort aircraft carrier, the U. S. S. Long Island, had a part in the history-making victory at Midway. Its 'planes covered the operations of certain warships that turned back the Jap fleet bound for Hawaii.

The Long Island's appearance in the Pacific came after her pioneer work fighting U-boats. Her first air squadron, "composite one", recently was disbanded after receiving a presidential unit citation for having sunk, probably sunk or seriously damaged more enemy submarines than any other team in naval history, up to November 10, 1943.

With the easing of war demands, Busch-Sulzer will be able to step up rapidly its delivery of engines to peacetime customers without reconversion. Now is the time to decide what you need and assure yourself of early delivery. Please write us concerning your requirements.

BUSCH-SULZER
ST. LOUIS

BUSCH-SULZER BROS.–DIESEL ENGINE COMPANY • SAINT LOUIS

AMERICA'S OLDEST BUILDER OF DIESEL ENGINES

ARCHITECTURE

(*Continued from page* 31)

—building lots sold at so much per front foot.

Naturally, many functions now imposed upon that old street, block and lot pattern could not possibly have been foreseen in horse-and-buggy days. Other functions might have been assumed as probable, but they were not. In short, our urban centers were not planned to serve the complex and ever changing functions of living: they were conceived and laid out to serve the short-term aims of exploitation and speculation in land. We still think of them in much the same terms. Therein lies the hitch in all urban planning proposals.

Out of these aims, recorded so vividly in physical patterns, there issued a series of architectural abominations—the row house of several rooms deep, the "dumb-bell" type of tenement house; and multiple dwelling in considerable variety—for rich and poor alike—covering 70%, 80%, 90% of the lot. Under pressure the architect was forced, upon pain of extinction, to ignore our most precious natural resources—daylight, sunlight, free movement of air—in the design of habitations and of commercial and industrial structures as well.

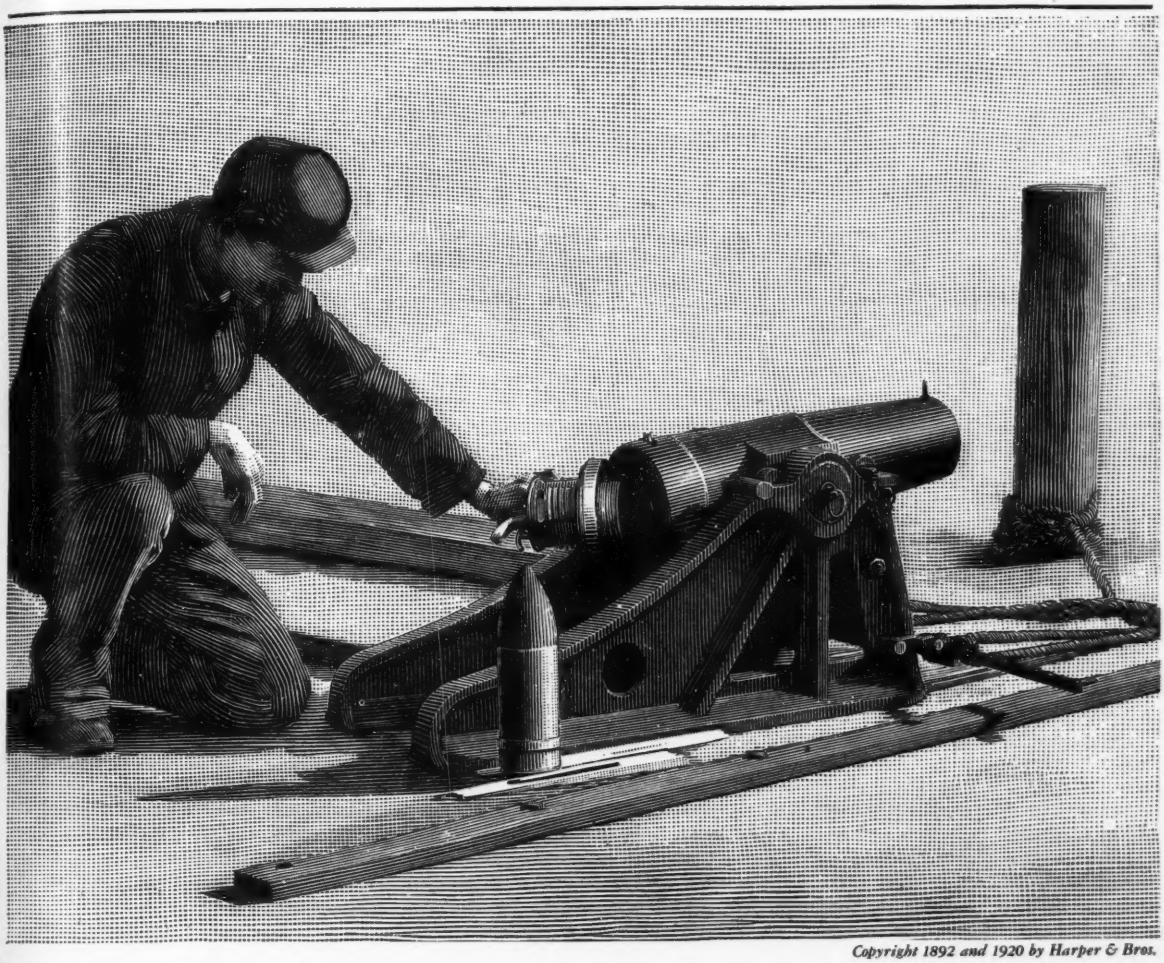
The rebuilding of our cities is not at all a fantastic suggestion; in fact, it lies well within the present frontiers of our industrial capacity, as two World Wars have clearly demonstrated. Indeed, it may well be that such a program of action will loom large as an imperative which would provide domestic outlet for our ever increasing capacity to produce goods during a period which will be characterized by decreasing man hours per unit produced.

But to do this we would have to prepare the way for further modification of the rights of ownership of the underlying land which now stand to subordinate the interest of the community: we have already made a feeble gesture in this direction by our building ordinances. And we would have to reshape the basic aims of our investment policy from investment for speculative profit to one in which financial procedures would acknowledge that we live in a world where physical decay takes place at fairly well known rates, and where the rate of obsolescence is a function of accelerating changes in the industrial arts; there are signs that we are becoming conscious of this basic fact.

One may question why so much consideration of urban planning, of building laws, of finance, etc. in a Note dealing with architecture after the war. The answer is a simple one: the architect designs structures for those who propose to erect them; and he must therefore conform to a very rigid set of principles (habits of thought) which have no bearing whatsoever in the solution of architectural problems of today and tomorrow. The architect may dream of functional architecture in a rational setting designed for working and living, but he knows from experience that before his dreams could materialize he would have to battle his way through the deep front lines of social, political and economic fortifications which have been built

(*Continued on page* 58)

"This is a Grinding War . . ."



Copyright 1892 and 1920 by Harper & Bros.

MORTAR'S GRANDPA

You could pick up this U. S. mortar about as easily as you could move a safe and it was about as easy to move around. But its advocates back in the nineties foresaw the importance of such armament in modern warfare.

Today's version can be carried at a brisk trot by a couple of men. It can go into action in seconds. It's a precision weapon —precision built, facts that many a Nazi and Jap have discovered with a jolt.

Where did a lot of the modern mortar's precision come from? From a little iron-bowl furnace in which over 52 years ago, Dr. Edward Goodrich Acheson created the first man-made abrasive. Since then abrasive products have become one of our most important production tools in the skilled hands of American industry.

Abrasive wheels are used to grind the parts of mortars, plane and tank engines, giant guns and other war weapons to unbelievable accuracy.

This accuracy is responsible not only for the efficient performance of these weapons — it also makes their mass production possible.

For mass production depends on interchangeability of parts. And interchangeability depends on split-hair precision.

Today it is almost impossible to put your finger on a single article mass produced for war or for peace that isn't in some way touched by grinding. On the land, in the air, on and under the sea, material produced by abrasive manufacturing methods are blasting the path to victory for the United Nations.

We at Carborundum are mindful that "this is a grinding war." Our efforts and resources are pledged to making it as short as possible.

* * *

These are just a few of the reasons why engineers believe a working knowledge of abrasives is a pretty good thing to have. Write us today for a complete set of 25 bulletins on the First Principles of Grinding. They're free. Address The Carborundum Company, Niagara Falls, New York.

THE CARBORUNDUM COMPANY

CARBORUNDUM AND ALOXITE ARE REGISTERED TRADE MARKS OF AND INDICATE MANUFACTURE BY THE CARBORUNDUM COMPANY

ARCHITECTURE

(*Continued from page* 56)

through the years to preserve the status quo.

Not until we are organized to approach the problem of redesigning our urban environment to accommodate the full range of functions involved in living in the 20th Century, in the same rational way we have, for example, approached the design of industrial plants, air fields, etc., with a view of providing ideal functional conditions, will our urban plans and our urban architecture develop into endemic symbols of a cultural scheme that is being reshaped by science, the machine process and the technology of physics and chemistry. We should not shudder, as so many do, at the war potential of science but should seek to broaden the field of its application because of the unbounded potentialities it holds for rational living and Peace.

In a small, fragmentary way we are now giving direction to urban rebuilding through the design of projects covering many blocks, through the three levels of Government sponsorship. And still more recently we took preliminary legislative steps which have already induced large institutional lenders to invest directly in super-block, medium-rental "Redevelopment Projects."

And something has already been accomplished—but not enough, by a wide margin. In this long overdue step of increasing the magnitudes of single operations from a few lots to many blocks providing habitations for groups of 10,000 . . . 40,000 or more persons, we are broadening our outlook and understanding of the problem of eliminating our decayed and obsolete environment.

Redevelopment Aims

But the institutional lender still looks upon "redevelopment", from the standpoint of investment of funds, under guidance of much the same body of criteria as guided development in the first instance. To the real estate interests it is still primarily a land deal—one, however, to which Government gives aid in the process of land assembly. To builders and material men, redevelopment gives prospect of bigger and better jobs. To the architect, redevelopment means, according to his individual point of view, more and larger jobs—or work with exciting, significant social and economic potentialities.

The ultimate outcome of urban rebuilding depends upon bringing about unity of purpose within the frame of broad, civic aims on the part of the sponsors of "Redevelopment Projects" and the officials of the City. The aim must focus upon weaving into the fabric of large projects the whole list of urban functions and social services which belong within each and every redeveloped area. And these projects must be so located that they will occupy a rational relationship to a rational pattern of urban functions which would constitute the framework of the future urban plan. Through such integrated effort we may acquire a better understanding of prevision—the economic utilization of land, daylight, sunlight, air, through their application, to concrete problems, of our ever expanding body of scientific knowledge—which is to say, through the exercise of Modern Common Sense.

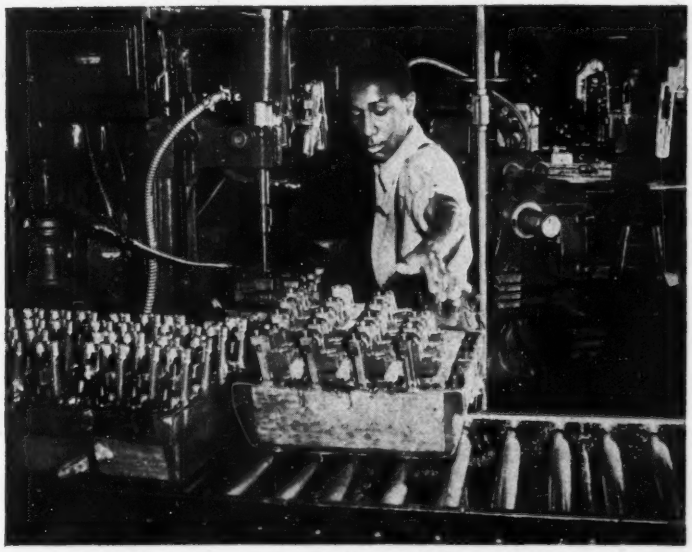
10% More Output

WITH 52% LESS HELP!

Springfield Armory Photos

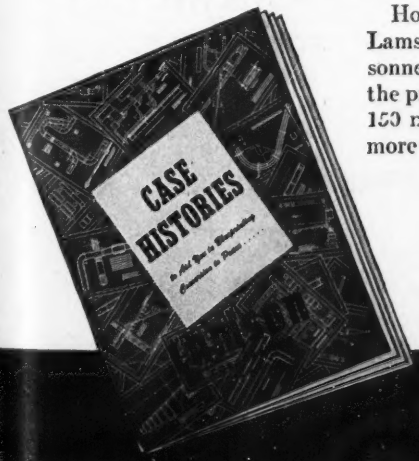
Another example of the increased efficiency made possible by

LAMSON *Conveyors*



★ When orders were issued to expand production of Garand rifles at the Springfield Armory, it became necessary to install a system of progressive manufacture, in place of the old, manpower-consuming method of hand-trucking from one operation to the next.

How well this was achieved is shown by the fact that after Lamson Conveyors were installed, in one department alone personnel was reduced from 54 to 26—and output increased 10%! On the production line turning out a single part (the cartridge receiver) 150 miles of walking per day were eliminated, releasing 30 men for more productive work!



In our new booklet "Case Histories to Aid You in Blueprinting Conversion to Peace" Lamson engineers present actual examples of the part played by Lamson Conveyors in streamlining production, eliminating manual handling and back-tracking. A complimentary copy will be promptly mailed you if you give your college and class.

LAMSON CORPORATION

Makers of Conveyors and Tubes

950 Lamson St., Syracuse 1, N. Y.

Construction Methods

(*Continued from page 42*)

housing units are only further extensions of pre-cutting, practiced prior to World War II, and it will not be until our peacetime economy is stabilized, that the practical evaluation of prefabrication can be made, and its future course determined.

Among the real problems facing the complete house prefabricator is the development of a continuing mass market, in order to realize fully on the benefits of mass production; also, how to meet the varying building and electrical code requirements, and how to satisfy the building officials as to the integrity and adequateness of the construction. Inquiry has indicated that public interest in prefabrication decreases very rapidly when the cost of the complete unit exceeds $4,000.

Manufacturers, however, are constantly on the alert to develop new materials which cost less than the traditional materials, and they are bound to develop composite constructions, or assemblies, which combine the desirable functions of several existing materials. It is in this sub-assembly field that prefabrication holds the highest promise. Designers of custom-built houses can plan on using sub-assemblies comprising floor and wall units, leaving an open well between the basement and the several floors for the placing of packaged heating systems, kitchen equipment, and bathrooms.

One great advance which the designers and material manufacturers can safely make without fear, is in modular or dimension coordination. Manufacturers, through dimensional coordination, should be able to reduce the number of sizes of standard materials, which should reduce inventories resulting from elimination of unnecessary sizes, resulting in consequential savings which can be passed along. The designer will, thus get flexibility in the planning of the building, which will be in common dimensional harmony with the manufacturer, whereby products can be designed and related to the work of construction without endless show drawings, field cutting delays, and other attendant evils.

MATERIALS

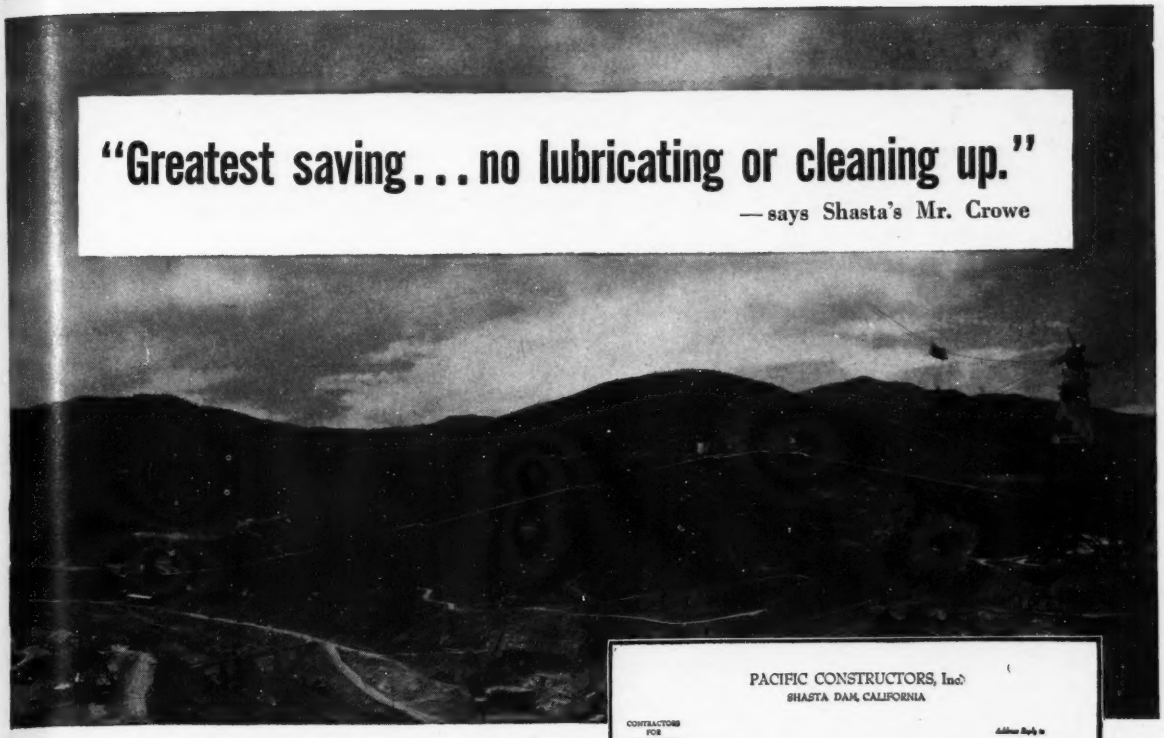
(*Continued from page 54*)

are made. It has proved effective against mosquitoes, flies, fleas, gnats, and to some extent against ticks, for one to six hours when applied to the skin, and for several days on clothing.

Nitrocellulose

THE heralding of what may prove to be a great development in industrial materials has come in the announcement that the Hercules Powder Company has done successful experimentation with flameproofed nitrocellulose. Production can not begin until certain practical problems have been solved, but when production does begin, the low cost of nitrocellulose may make this an important raw material for use in other industries.

Progress in plastics has been made in many directions. Synthetic rubber, transparent films and sheets, highly wear resistant machine parts, improved textile fibers, extremely strong laminates, and brilliantly colored decorations are but a few of the developments.



"Greatest saving... no lubricating or cleaning up."

— says Shasta's Mr. Crowe

PACIFIC CONSTRUCTORS, Inc.
SHASTA DAM, CALIFORNIA

CONTRACTORS FOR SHASTA DAM

Shasta Dam, California
January 18, 1944

The Conveyor Co.
3260 E. Slauson Avenue
Los Angeles, California

Gentlemen- Attention: Mr. W.H.Sexe, President.

As you know, our use of the troughing conveyor system at Shasta Dam using New Departure Conveyor Roll bearings and installed by your company, is about completed.

When this job was being discussed at the start, we questioned the use of New Departure Sealed Conveyor bearings in service on 36 inch belts carrying six inch rock at 450 feet per minute.

Considering that even in the building of Boulder Dam we had not had as large a conveyor problem, we were reluctant to experiment any more than we had to in designing equipment for Shasta Dam.

Now, after nearly four years with extremely low and satisfactory maintenance costs, approximately 13,000,000 tons have been handled with this equipment.

We know that the greatest saving in the use of this design was in the elimination of lubricating and of cleaning up after lubricating, made possible by the use of sealed bearings.

It is a pleasure to advise you that your troughing idlers using New Departure Sealed bearings have been very satisfactory.

Yours very truly
PACIFIC CONSTRUCTORS, INC.
By
General Superintendent

TTC:f

THE last link in the 10-mile Shasta Dam conveying system is a mile and a half unit made by the Conveyor Company of Los Angeles, using 17,500 New Departure Self-Sealed Ball Bearings of two types.

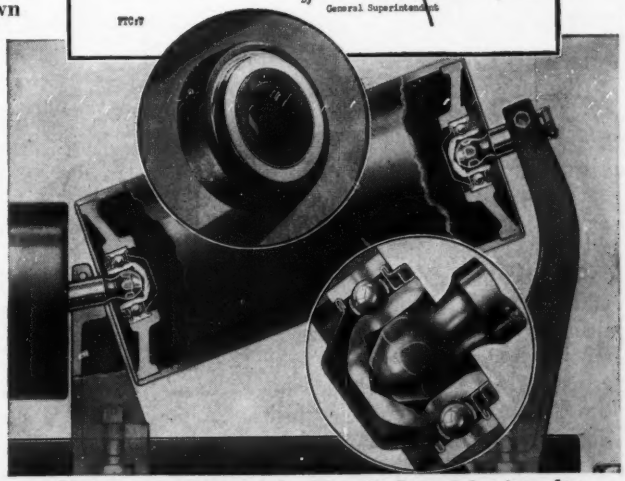
For nearly four years this system has handled 13 million tons of rock as big as 6 inches in diameter.

The satisfactory service obtained is proof that these self-sealed "Lubricated-for-life" ball bearings are not only equal to the job but effect great savings in time and lubricant.

New Departure engineers will be glad to suggest how you may use these ball bearings to your own advantage, when they are again available. Ask for Booklet C.

New Departure, Division of General Motors Corporation, Bristol, Connecticut. Los Angeles, Chicago and Detroit.

3281



Bearings are lubricated for life. Shafts and bearings designed to prevent cramping or slippage. Units easily set up.

NEW DEPARTURE

BALL BEARINGS

Nothing Rolls Like a Ball

COMMUNICATIONS

(*Continued from page* 16)

meet the requirements of aircraft-engine testing.

Some of the more important studies of electrical transients that are possible through the use of this cathode-ray oscillograph are the operation of lightning arresters and their components, the nature of the steep-front impulses and their effect on insulation, circuit interruption, and phenomena involving sparks such as airplane-engine ignition systems.

Airplane Radios

In the post-war decade there may be as many as 500,000 civil airplanes in the U. S., most of them privately owned; it is inevitable that many of these will be equipped with radio. The uses of this radio will be manifold.

First, the private flier will want radio to make his flying simpler and safer. The radio compass will step into the picture for this need. It can be utilized to guide a plane straight toward the station to which it is tuned. These radios will be especially valuable in teaching new fliers.

Perhaps most important, the private flier will need and demand radio for his use in obtaining weather information. This will also increase the factor of safety. In quantity production, such equipment should sell for a modest price. At least one company now is prepared to sell the receiver alone for less than $30. For communication many private owners will want a transmitter operating on a high frequency for communication with airport towers. This will cost about $50 and a complete installation, about $150.

Static

Radio listeners are due for a very pleasant surprise after the war when civilian production of Goodyear's "radio static neutralizer" is begun. It is devised to eliminate static due to atmospheric conditions as well as machines, and makes use of small electronic tubes in such manner that they are automatically adjusted to each radio signal. They serve to discriminate between the static and the desired signal and will automatically control the amount of static energy passing through the radio.

Women flame-fashion steel for war

Using the fastest of cutting tools—the oxyacetylene flame—in Airco multiple-torch gas cutting machines, women operators throughout industry quickly fashion steel into the vast array of shapes required for a host of war products.

Airco gas cutting machines are designed for easy—almost automatic—operation, and for this reason women with even slight mechanical experience have proved able to run them successfully. Today in shipyards and tank arsenals—in literally thousands of war plants—women operators and Airco machines are speeding production of steel weapons to hasten the arrival of "V" Day.

Simplicity and ease of operation are outstanding characteristics of all Air Reduction gas cutting machines. They are made in a wide range of types and sizes to meet every steel-cutting requirement of industry.

If you would like to receive our informative publication, "Airco in the News," we shall be glad to send a free copy. Write to Mr. G. Van Alstyne, Dept. C. P., Air Reduction, 60 East 42nd Street, New York 17, N. Y.

SEND FOR FREE BOOKLET, "AIRCO IN THE NEWS"

AIR REDUCTION SALES COMPANY
MAGNOLIA AIRCO GAS PRODUCTS CO.
NATIONAL CARBIDE CORPORATION
PURE CARBONIC INCORPORATED
THE OHIO CHEMICAL AND MFG. CO.
WILSON WELDER & METALS CO., INC.

AIRCO **AIR REDUCTION**
60 EAST 42nd STREET NEW YORK 17, N. Y.

OXYGEN, ACETYLENE AND OTHER ATMOSPHERIC GASES • GAS WELDING AND CUTTING APPARATUS • CALCIUM CARBIDE ARC WELDING MACHINES AND SUPPLIES • CARBON DIOXIDE • "DRY ICE" • ANAESTHETIC AND THERAPEUTIC GASES AND APPARATUS

Cornell's Post War Engineering Plans

By S. C. HOLLISTER

Dean of The College of Engineering

Dean Hollister

THE primary function of the College is to prepare young men and women for the profession of engineering. Hence, the planning of such training hinges upon an evaluation of the function of the engineer in the future. The freshman entering the College in 1945 will begin to reach his prime in professional work in 1965 or 1970, some fifteen or twenty years out of college. It is at such time that his training must meet its most critical test. An appraisal, therefore, of the future of engineering and of the service the engineering graduate will be called upon to render is of fundamental importance.

Engineering Outlook

What is the outlook for engineering? Over the last fifty years there has been a steady growth in the application of science toward increasing the conveniences of living and working. In this development the engineer has played a leading role. We have diesel and gasoline engines, refrigeration in the home, air conditioning, automobiles, airplanes, radios, artificial silk, synthetic rubber, high-octane gasoline, plastics, light weight metals, and a host of other facilities and conveniences that are commonplace in our daily life. In fact, our American way of life is geared to full dependence upon these facilities. Imagine if you can what life would be like without the conveniences furnished by such developments as I have just mentioned. It is unthinkable that we should recede from their use and from the way of life they afford.

But this is only the beginning. These advances have been emerging with a constantly increasing tempo and with ever-widening utilization of the fundamental developments in the sciences. It has been the role of the engineer to interpret the advances of basic science for application to our daily needs. This rising tide of development can not and must not be checked. The engineer, who has played such an important part in the developments up to this time, will continue to serve in the ever-expanding developments in the future. While the early achievements in this direction frequently involved simple principles, the demand of the present day calls for much more intricate scientific application. It is to be expected that in the future this technical intensification will increase. To this end the training of engineers for the future must involve thorough training in the fundamentals of science.

Non-Technical Requirements

Up to this point we have considered only the technological aspects of the function of the engineer in the future. However, this is but one segment of his activities. To a constantly widening degree, the engineer has been chosen for managerial responsibilities in industry and public services. To an increasing extent he is called upon to direct the affairs of large utilities in the fields of communication, transportation, and power development; to design, construct and operate great public works, such as river and harbor improvements, flood control, water supply, sanitation, highway systems, airports, rail and water terminal facilities. In the discharge of his duties he is called upon not alone to exercise his technical knowledge and judgment, but also to deal with matters relating to finance and other business aspects of the operation; the equitable and effective direction of labor; and other economic and social benefits to be derived by the public use of the facilities he has created. He must of necessity, therefore, if he is to be a leader in these activities, be broadly trained for the economic and humanistic functions in which he will be obliged to participate.

If the engineer of the future is to be adequately trained to meet these responsibilities, the plan of his education must meet the objectives dictated by the service which he is ultimately to be called upon to perform. Certainly he must be adequately trained in the technical aspects of engineering. He must be soundly grounded in the science of physics and chemistry and in mathematics. He must have a thorough training in the materials of engineering, in their manufacture and application. He must be acquainted with the procedures of design, construction and operation and with industrial technology.

In addition to this sound technical training, his education must be broadened to include a facile use of English, both written and oral. He should understand the basic principles of economics and psychology. He should have a broad

(*Continued on page 66*)

Some Suggestions About Your Future Career

Every young man with a job to do now—whether it is training for the services, or actually serving, as millions of you are—looks forward to the day when he can begin his career.

There are going to be many exciting things to do.

From what we see ahead for aluminum, may we venture a few suggestions?

You can learn a lot about the progressiveness of a future employer by finding out what he is doing about using aluminum in his business. For instance . . .

If you see a lot of aluminum on a new product, that's a good line for you to sell.

If you see a lot of aluminum used in the shop to make things light and easy to handle, that's a good company to be with.

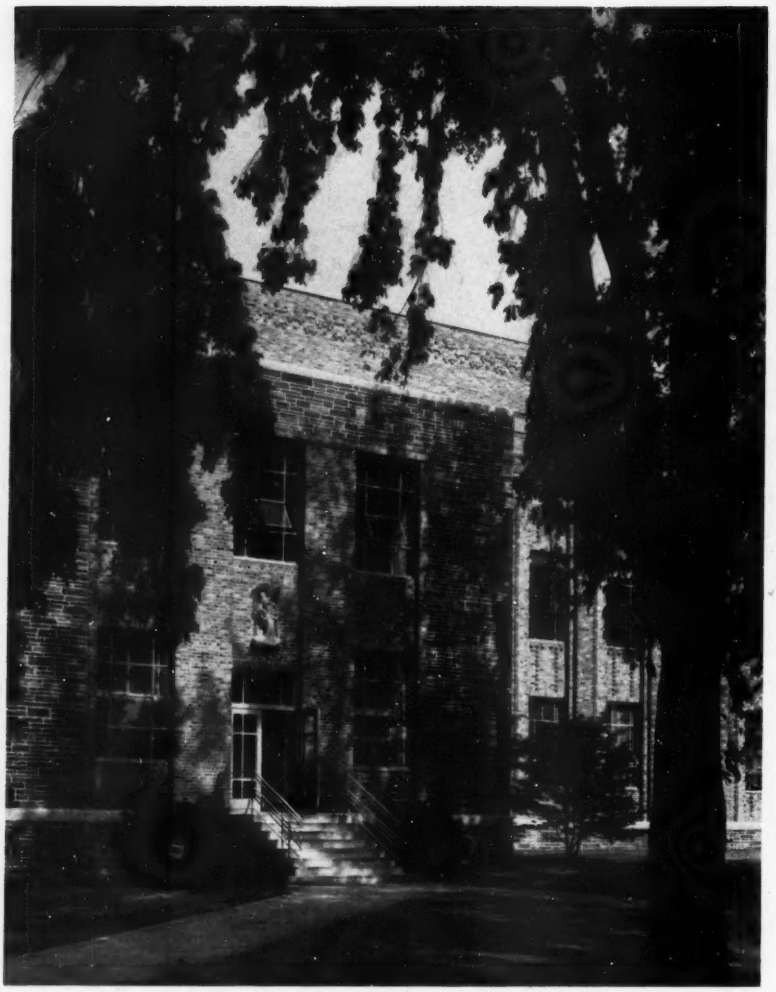
If you see a chance to make anything, or sell anything, or work with anything made of aluminum, you're going to be way out in front.

This is how we see it at Alcoa . . . the first name in Aluminum.

A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF

ALCOA ALUMINUM

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.



Buildings as functional and beautiful as Olin Hall will greatly aid Cornell's plans for engineering training after the war.

and comprehensive understanding of the development of our modern civilization, and of the basic factors that have molded what we call the American way of life. He should be well grounded in the major phases of management, including corporate and industrial organization, cost accounting, money and banking, and labor relations.

The engineering faculty at Cornell is convinced that such a program of training is necessary to one who is intent upon fitting himself for leadership in the various positions in which an engineer is called upon to serve. It is likewise convinced that there can not be a reduction in the amount of technical training that has been included in engineering training programs up to this time. The only way, therefore, that this broader program coupled with a sound technical education can be provided, is by an extension of the length of the training period.

Cornell will, therefore, in the post-war period abandon its former programs of four-year engineering courses and will, in their stead, offer five-year programs in the four major branches of engineering; namely, Civil, Chemical, Electrical and Mechanical Engineering. Students who have already started four-year courses will be continued on such courses until their work is completed.

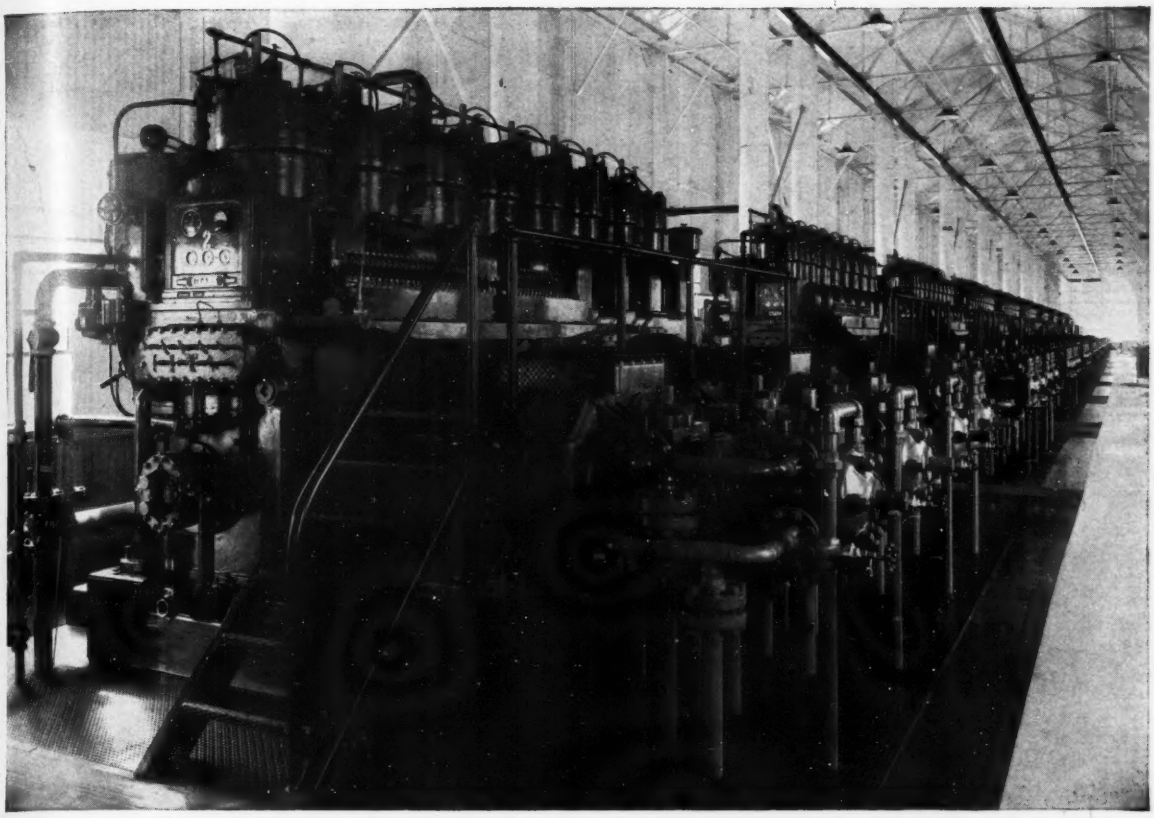
The new curricula, in effect, will combine much of the content of the former courses in Administrative Engineering with those of the four major branches of engineering. It will provide a minimum of twenty per cent nontechnical studies. These will be arranged in a sequential stem throughout the five years running in parallel with the sequences in technical studies. Through such a step the College can, with confidence, provide adequate training for its future graduates in engineering.

In the immediate post-war period during the time when returning veterans are finishing their engineering training, the College will continue to operate on the accelerated three-term basis. As soon thereafter as practicable, however, we will return to the normal twoterm schedule.

The College Now

THE College of Engineering is deeply engaged in training activities related to winning the war. Since the inauguration of the Navy College Training Program in July, 1943, the College has had a large contingent of navy and marine students in the V-12 program, training on a threeterm yearly basis. The College has also participated in the operations of the Naval Training Station in courses in Diesel Engineering and Marine Steam Engineering for officers and midshipmen. Civilian students physically unfit or below military age and a number of young women are also being trained in the regular college program. They form a small but important part of the College's training program.

Besides students being trained on the campus, the College has participated in the ESMWT program conducted in 18 centers in New York for 60,000 personnel engaged in war industries.



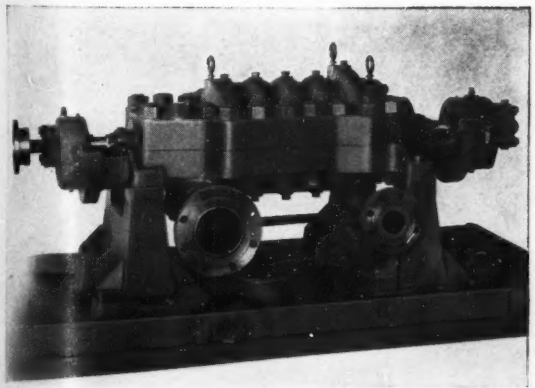
Eleven 8-cylinder 800 BHP CLARK "Angles" in La Gloria Corporation Recycling Plant, Falfurrias, Texas.

Achievements in the Field

PACIFIC PUMP WORKS

Boiler Feed Pumps in oil refineries, power houses and utility field must be tough and efficient. For this purpose, Pacific manufactures a complete line of centrifugal pumps in types and sizes to meet all flow conditions—High Pressure multi-stage pumps, capacities up to 1500 G.P.M. Solid forged-steel case multi-stage pumps for higher pressures—single and two-stage pumps for lower pressures.

Illustrated below is one of the many types giving unsurpassed service in this important field.



Pacific Type JBMB—Size 3-inch precision engineered 5-stage Boiler Feed Water Pump No. 7138, installed in a large Western oil refinery.

CLARK BROS. CO., INC.

This battery of eleven 8-cylinder, 800 BHP CLARK "Angles" in the recycling plant of the La Gloria Corporation, near Falfurrias, Texas, is one of the largest compressor plants ever placed in operation. The daily capacity is 185,000,000 cu. ft. of gas.

The plant is a unitization project, handling the recycling operations of the entire La Gloria Field for the four major oil companies which control its production. The compressors operate at 1500 lbs. suction pressure and return the gas to two separate sands at discharge pressures of 2700 lbs. and 3100 lbs., respectively.

Clark Bros. Co., Inc. and Pacific Pump Works are individually operating members of the Dresser Industries.

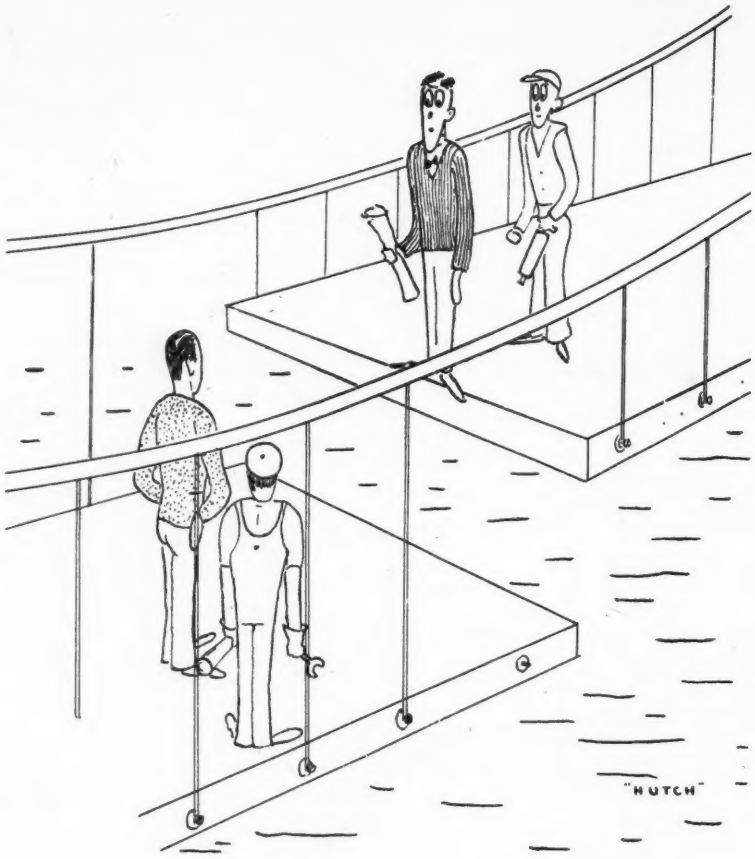
"Two of the Dresser Industries"

CLARK BROS. CO., INC.
OLEAN, NEW YORK

PACIFIC PUMP WORKS
HUNTINGTON PARK, CALIFORNIA

NEW YORK, NEW YORK
HOUSTON, TEXAS
TULSA, OKLAHOMA
CHICAGO, ILLINOIS
BOSTON, MASSACHUSETTS
HUNTINGTON PARK, CALIFORNIA

Stress & Strain



DUST ON YOUR SLIDERULE, JENKINS?

A preacher walked into a saloon, ordered milk, and by mistake was served milk punch.

After drinking it, the holy man lifted his eyes to heaven and was heard to say, "Oh, Lord, what a cow!"

Ohio State Sundial

* * *

There is nothing strange about saying that the modern girl is a live wire. She carries practically no insulation.

* * *

Did you hear about the little moron who transferred from Cornell to Penn State and raised the IQ of both colleges?

"All right then, don't kiss me goodnight!"

Officer of the Watch: "Is this the first time you have stood watch on this station?"

New V-12: "Yes, sir."

OOW: "Has the chief told you what to do?"

V-12: "Yes, sir. He said to wake him up when I saw you coming."

* * *

"Yes, madam, what can I do for you today?"

"I'm going to be married next Tuesday, and I would like to get some silk pajamas. What color is appropriate for a bride?"

"White is the preferred color if it is your first marriage, and lavender if you have been married before."

"Well, you'd better give me some white ones with just a wee touch of lavender in them."

—Powerfax

* * *

He: "Where did you learn to kiss, dear?"

She: "Dragging heavy malted milk up a straw. Why?"

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